# VNX Unified Storage Implementation Lab Guide

August 2011



EMC² where information lives®

# Copyright

Copyright © 1996, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010., 2011 EMC Corporation. All Rights Reserved. EMC believes the information in this publication is accurate as of its publication date. The information is subject to change without notice.

THE INFORMATION IN THIS PUBLICATION IS PROVIDED "AS IS." EMC CORPORATION MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WITH RESPECT TO THE INFORMATION IN THIS PUBLICATION, AND SPECIFICALLY DISCLAIMS IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Use, copying, and distribution of any EMC software described in this publication requires an applicable software license.

EMC2, EMC, Data Domain, RSA, EMC Centera, EMC ControlCenter, EMC LifeLine, EMC OnCourse, EMC Proven, EMC Snap, EMC SourceOne, EMC Storage Administrator, Acartus, Access Logix, AdvantEdge, AlphaStor, ApplicationXtender, ArchiveXtender, Atmos, Authentica, Authentic Problems, Automated Resource Manager, AutoStart, AutoSwap, AVALONidm, Avamar, Captiva, Catalog Solution, C-Clip, Celerra, Celerra Replicator, Centera, CenterStage, CentraStar, ClaimPack, ClaimsEditor, CLARiiON, ClientPak, Codebook Correlation Technology, Common Information Model, Configuration Intelligence, Configuresoft, Connectrix, CopyCross, CopyPoint, Dantz, DatabaseXtender, Direct Matrix Architecture, DiskXtender, DiskXtender 2000, Document Sciences, Documentum, elnput, E-Lab, EmailXaminer, EmailXtender, Enginuity, eRoom, Event Explorer, FarPoint, FirstPass, FLARE, FormWare, Geosynchrony, Global File Virtualization, Graphic Visualization, Greenplum, HighRoad, HomeBase, InfoMover, Infoscape, Infra, InputAccel, InputAccel Express, Invista, Ionix, ISIS, Max Retriever, MediaStor, MirrorView, Navisphere, NetWorker, nLayers, OnAlert, OpenScale, PixTools, Powerlink, PowerPath, PowerSnap, QuickScan, Rainfinity, RepliCare, RepliStor, ResourcePak, Retrospect, RSA, the RSA logo, SafeLine, SAN Advisor, SAN Copy, SAN Manager, Smarts, SnapImage, SnapSure, SnapView, SRDF, StorageScope, SupportMate, SymmAPI, SymmEnabler, Symmetrix, Symmetrix DMX, Symmetrix VMAX, TimeFinder, UltraFlex, UltraPoint, UltraScale, Unisphere, VMAX, Vblock, Viewlets, Virtual Matrix, Virtual Matrix Architecture, Virtual Provisioning, VisualSAN, VisualSRM, Voyence, VPLEX, VSAM-Assist, WebXtender, xPression, xPresso, YottaYotta, the EMC logo, and where information lives, are registered trademarks or trademarks of EMC Corporation in the United States and other countries.

All other trademarks used herein are the property of their respective owners.

© Copyright 2011 EMC Corporation. All rights reserved. Published in the USA.

Revision Date: May 6, 2011

Revision Number: MR-7CP-VNXUNIIMP.1.0

## Document Revision History

| Rev # | File Name | Date |
|---|---|---|
| 1.0 | VNX Unified Storage Implementation Lab Guide | 07/2011 |



EMC² where information lives®

# Table of Contents


**COPYRIGHT** ..... **2**

**DOCUMENT REVISION HISTORY** ..... **3**

**PRE-LAB EXERCISES INTRODUCTION** ..... **8**

**LAB EXERCISE 1: IMPLEMENTING UNISPHERE SECURITY** ..... **9**

LAB 1: PART 1 – VERIFY DOMAIN SECURITY AND DEFINE A GLOBAL USER ACCOUNT ..... 10

LAB EXERCISE 2: VNX SYSTEM CONFIGURATION ..... **17**

LAB 2: PART 1 – CONFIGURE VNX SP MEMORY ..... 18
LAB 2: PART 2 – CONFIGURE SP CACHE SETTINGS ..... 21
LAB 2: PART 3 – VERIFY SP NETWORK CONFIGURATION ..... 23

**LAB EXERCISE 3: STORAGE CONFIGURATION** ..... **25**

LAB 3: PART 1 – PROVISIONING STORAGE FOR VNX FILE ..... 26
LAB 3: PART 2 – CREATE POOLS AND RAID GROUPS ..... 30
LAB 3: PART 3 – CREATE TRADITIONAL LUNS ..... 32
LAB 3: PART 4 – CREATE THICK AND THIN LUNS ..... 34

**LAB EXERCISE 4: CONFIGURING HOST ACCESS TO VNX LUNS - WINDOWS** ..... **37**

LAB 4: PART 1 – INSTALLING HBA DRIVERS - WINDOWS ..... 39
LAB 4: PART 2 – INSTALLING POWERPATH ..... 46
LAB 4: PART 3 – INSTALLING THE UNISPHERE AGENT ..... 52
LAB 4: PART 4 – INSTALLING NAVISPHERE SECURE CLI ..... 54
LAB 4: PART 5 – VERIFYING THE VNX ARRAY IS CONFIGURED TO AUTO-MANAGE HOSTS ..... 57
LAB 4: PART 6 – CREATE AND POPULATE STORAGE GROUPS WITH EMC UNISPHERE - WINDOWS 59
LAB 4: PART 7 – CONFIGURE WINDOWS HOST ACCESS TO LUNS ..... 61
LAB 4: PART 8 – REMOVE THE WINDOWS HOST FROM ITS STORAGE GROUP IN PREPARTION FOR THE LINUX LABS ..... 64

**LAB EXERCISE 5: CONFIGURING HOST ACCESS TO VNX LUNS - LINUX** ..... **67**

LAB 5: PART 1 - INSTALLING EMULEX DRIVERS ON A LINUX HOST ..... 69
LAB 5: PART 2 - INSTALLING POWERPATH SOFTWARE ON A LINUX HOST ..... 80
LAB 5: PART 3 - INSTALL THE UNISPHERE AGENT & NAVISPHERE SECURE CLI SOFTWARE ON YOUR LINUX HOST ..... 84
LAB 5: PART 4 - CREATE AND POPULATE STORAGE GROUPS WITH EMC UNISPHERE – LINUX ..... 90
LAB 5: PART 5 - CONFIGURE LINUX HOST ACCESS TO LUNS ..... 93
LAB 5: PART 6 - REMOVE THE THE LINUX HOST FROM THE STORAGE GROUP IN PREPARTION TO WORK WITH WINDOWS AGAIN ..... 103
LAB 5: PART 6 ADDENDUM – PARTITION LINUX DEVICES THROUGH THE COMMAND LINE INTERFACE ..... 106
LAB 5: PART 7 – VNX ISCSI PORT CONFIGURATION INFORMATION CONFIRMATION ..... 108
LAB 5: PART 8 – CREATE AND POPULATE STORAGE GROUPS FOR WINDOWS & LINUX ISCSI HOSTS 109




EMC² where information lives®

**LAB EXERCISE 6: ADVANCED STORAGE POOL LUN OPERATIONS ..... 113**

LAB 6: PART 1 – EXPANDING POOL LUNS ..... 114
LAB 6: PART 2 – EXPANDING RAID GROUP LUNS ..... 117

**LAB EXERCISE 7: NETWORK AND FILE SYSTEM CONFIGURATION ..... 121**

LAB 7: PART 1 – CONFIGURE NETWORKING ON VNX ..... 122
LAB 7: PART 2 – CONFIGURE AND MANAGE FILE SYSTEMS FOR VNX ..... 126

**LAB EXERCISE 8: NFS FILE SYSTEM EXPORT AND PERMISSIONS ..... 131**

LAB 8: PART 1 – EXPORTING FILE SYSTEMS FOR NFS CLIENTS ..... 132
LAB 8: PART 2 – ASSIGNING ROOT PRIVILEGES ..... 138

**LAB EXERCISE 9: CIFS IMPLEMENTATION ..... 145**

LAB 9: PART 1 – PREPARING THE SYSTEM FOR CIFS ..... 146
LAB 9: PART 2 – CREATE AND JOIN A CIFS SERVER ..... 151
LAB 9: PART 3 – CREATE A CIFS SHARE ..... 154
LAB 9: PART 4 – DELETING A CIFS SERVER ..... 164

**LAB EXERCISE 10: IMPLEMENTING FILE SYSTEM QUOTAS ..... 167**

LAB 10: PART 1 – CONFIGURING QUOTAS USING THE WINDOWS & UNISPHERE ..... 168
LAB 10: PART 2 – VIEW QUOTA REPORTS FROM A LINUX CLIENT ..... 180

**LAB EXERCISE 11: CIFS FEATURES ..... 183**

LAB 11: PART 1 - CONFIGURE A CIFS AUDIT POLICY ..... 184
LAB 11: PART 2 - CONFIGURING CIFS FOR HOME DIRECTORIES ..... 188

**LAB EXERCISE 12: NETWORKING FEATURES ..... 191**

LAB 12: PART 1 – CONFIGURING LACP ..... 192
LAB 12: PART 2 – CONFIGURE AN FSN DEVICE ..... 197

**LAB 13: CREATE AN EVENT MONITOR TEMPLATE ..... 201**

LAB 13: PART 1 – CONFIGURING A CENTRALIZED MONITOR USING THE CONFIGURATION WIZARD 202

**LAB EXERCISE 14: SNAPVIEW SNAPSHOTS ..... 205**

LAB 14: PART 1 – ALLOCATE LUNS TO THE RESERVED LUN POOL WITH EMC UNISPHERE ..... 207
LAB 14: PART 2 - CREATE A SNAPVIEW SNAPSHOT WITH EMC UNISPHERE ON WINDOWS ..... 209
LAB 14: PART 3 - TEST PERSISTENCE OF A SNAPVIEW SESSION ..... 213
LAB 14: PART 4 - TEST THE SNAPVIEW ROLLBACK FEATURE WITH EMC UNISPHERE ..... 214
LAB 14: PART 5 - START AND TEST A CONSISTENT SNAPVIEW SESSION WITH EMC UNISPHERE 216
LAB 14: PART 6 - TEST THE OPERATION OF THE RESERVED LUN POOL WITH EMC UNISPHERE ON WINDOWS ..... 217

**LAB EXERCISE 15: SNAPVIEW CLONE ..... 221**

LAB 15: PART 1 – ALLOCATE CLONE PRIVATE LUNS AND ENABLE PROTECTED RESTORE ..... 222
LAB 15: PART 2 – CREATE AND TEST A CLONE USING EMC UNISPHERE ..... 223
LAB 15: PART 3 – PERFORM A CLONE CONSISTENT FRACTURE ..... 226



EMC² where information lives®

**LAB EXERCISE 16: VNX SNAPSURE ..... 227**

LAB 16: PART 1 – CONFIGURING SNAPSURE ..... 228
LAB 16: PART 2 – RESTORE AND REFRESH SNAPSHOTS WITH NFS ..... 232
LAB 16: PART 3 – RESTORE AND REFRESH SNAPSHOTS WITH CIFS ..... 237
LAB 16: PART 4 – CONFIGURING WRITEABLE SNAPSHOTS WITH CIFS ..... 240

**APPENDIX A: HURRICANE MARINE, LTD ..... 243**

**APPENDIX A: HURRICANE MARINE, LTD – CONT. ..... 244**

**APPENDIX B: HURRICANE MARINE DOMAIN ENVIRONMENTS ..... 245**

**APPENDIX C: WINDOWS USER AND GROUP MEMBERSHIPS ..... 246**

**APPENDIX D: LINUX USERS AND GROUPS ..... 247**

**APPENDIX F: TEAM – IP ADDRESSES SUMMARY ..... 249**



EMC² where information lives®

| Important | The following lab exercises provide the steps for setting up Windows and Linux to interact with the VNX-series storage system through Block and File connectivity.<br><br>**A few important notes!**<br><br>**Note 1:** You will be required throughout the lab to work on Physical Hosts as well as VMs (Virtual Machines). Please read through the purpose section of each lab to verify what host and setup you should be working with prior to starting the lab. If there is any confusion prior to starting the labs then please contact the instructor and work out any issues you may be having with them.<br><br>**Note 2:** Not all screen captures were made on the lab equipment you will be using and therefore may differ slightly from what you will see. **Read each lab and step completely before attempting it; do not simply follow the pictures!**<br><br>**Note 3:** The names of the files used to install the VNX software may differ slightly from one revision to the next. As an example, the Unisphere Server Utility software for this OE revision is presented with the following naming convention:<br><br>• *UnisphereServerUtil-Win-32-x86-en_US-1.1.0.1.0366-1.exe*<br><br>**Note 4:** All hardware and software assignments per team are listed in the Appendix F of this student guide.<br><br>**Note 5:** Not all physical lab setups are put together in the same way. Please understand the setup you may be working on ***may*** differ slightly from the one we are describing in the labs. Contact the instructor if you are confused on any of the steps during the duration of the course. |
|---|---|



EMC² where information lives®

# Lab Exercise 1: Implementing Unisphere Security

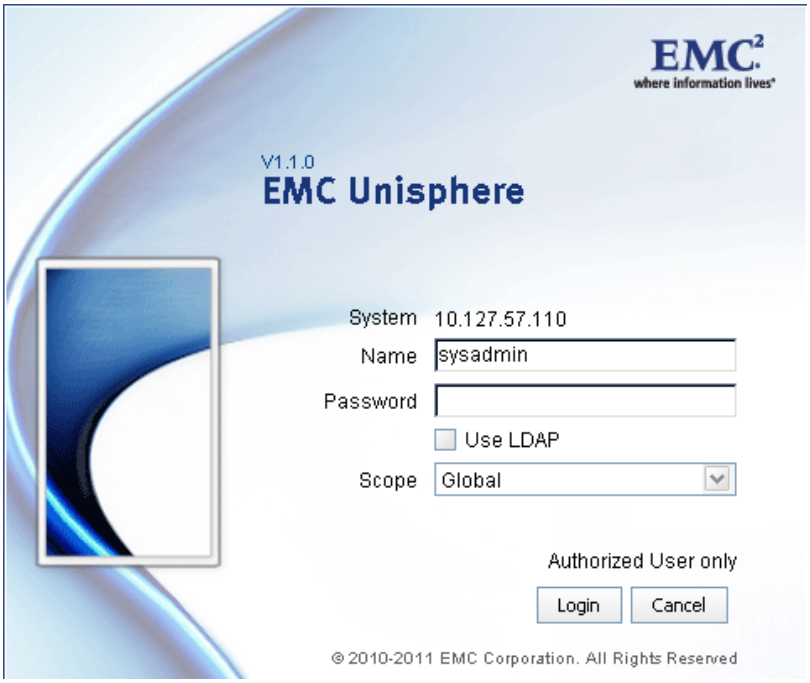
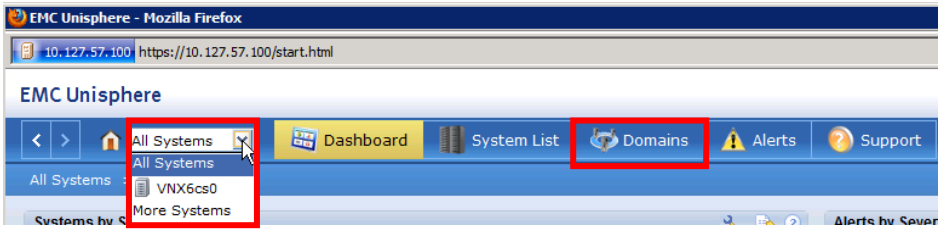
| | |
|---|---|
| **Purpose:** | These lab exercises provide the steps for setting up a Windows based management station and using the management station to configure the required hardware and software on a VNX-series storage system.<br><br>**Synopsis:**<br><br>You have just implemented a successful installation of a VNX array for your customer. The VNX Installation Assistant (VIA) has already been run on the systems you will be working and they have already been set up with prerequisite software and enablers. The hosts, however, will need to be setup and have all necessary software installed since they are without it presently.<br><br>*Hurricane Marine, LTD* hired a new member for the Storage Administration Team. Tim Taler (username: Ttaler) is not yet a part of the Company's Microsoft AD. He has some experience with VNX Snapshots for File. (We will cover Snapshots later in this course.)<br><br>The head of the IT department, would like to give Tim **administrative privileges** to manage file system snapshots. |

| | |
|---|---|
| **Tasks:** | In this lab exercise, you will perform the following tasks:<br><br>• Configure and Verify Domain Security<br>• Create a Global User account on the VNX<br>• Create a local Group on the VNX<br>• Define a new Role |



EMC² where information lives®

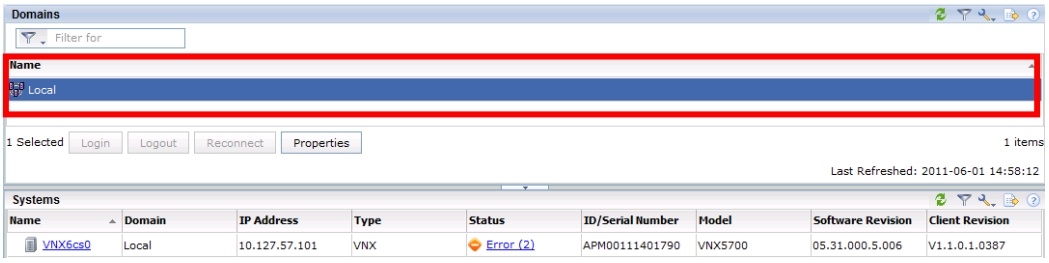
# Lab 1: Part 1 – Verify Domain Security and Define a Global User Account

| Step | Action |
|---|---|
| 1 | **System Login:**<br><br>• Login to your team's VM Windows host named **Win-X** where **X** is your team number (refer to your team's Appendix). The username will be **Administrator** and the password will be **adXmin** where X is the subnet address provided by the instructor.<br>• Connect to Unisphere in your Windows workstation by opening an Internet browser and entering your **Control Station's IP address** (VNX#cs0 where # is your team number - refer to your team's Appendix). If a Licensing Window appears click Accept.<br>• Login to Unisphere using the credentials for the default **sysadmin** user located in the **Appendix**.<br><br>  |
| 2 | **Verify Domain Security:**<br><br>• If not already selected, then select **All Systems** from the systems selector drop-down. The click on the Domains menu item as shown here.<br><br>  |



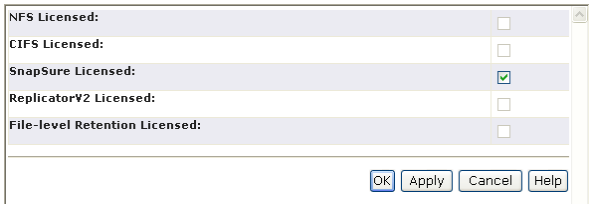
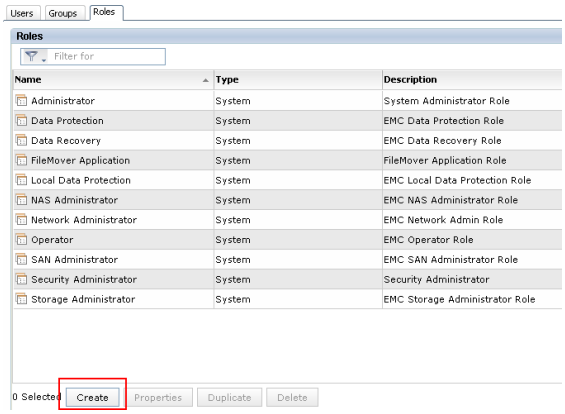
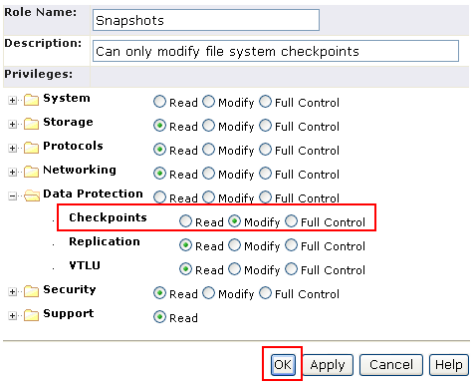
EMC² where information lives®

| Step | Action |
|---|---|
| 3 | • Choose Local under the Domains' Name heading as shown here. Verify the IP Address listed under the System's heading is the IP Address of your SP-A.<br><br>If it is not the Master Node then how could you change that assignment within Unisphere?<br><br>_____<br><br>Which IP Addresses can fulfill the role of Master Node?<br><br>_____ |



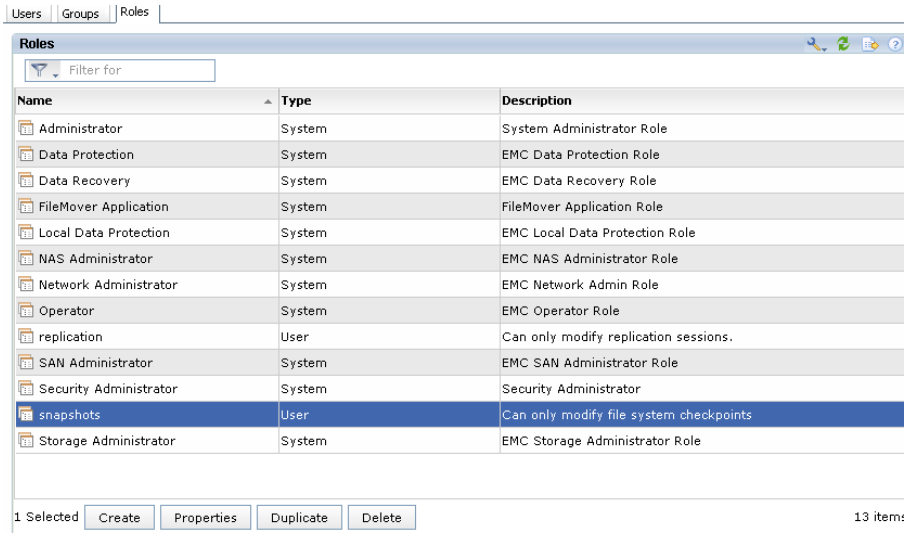
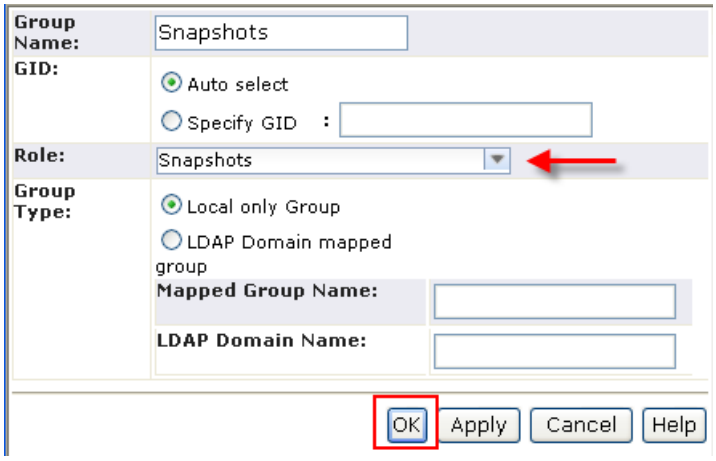



EMC² where information lives®

| Step | Action |
|---|---|
| 3 | **Create a user-defined Role:**<br><br>• In this step, you will create a new administrative role on the system for managing SnapSure. This will first require the **SnapSure** license to be enabled. In the **All Systems** drop-down, select your VNX, then on the top menu bar click on the **Settings** button. From the right-side Tasks pane in the **More Setting** section, select **Manage License for File**. Check the **SnapSure Licensed:** option and click **OK**. To prepare for additional labs, also enable the licenses for **any unchecked licenses** by checking a license one at a time and selecting OK. **This may take a short amount of time, please be patient!**<br><br>  <br><br>• Navigate to **Settings > Security > User Management > User Customization for File > Roles tab**.<br>• Click the **Create** button and create a role according to the following information:<br>Role Name: **Snapshots**<br>Description: **Can only modify file system checkpoints.**<br>Privileges: Expand **Data Protection** and select the **Checkpoints - Modify** radio button.<br>Click **OK.**<br><br>  <br><br>  |



EMC² where information lives®

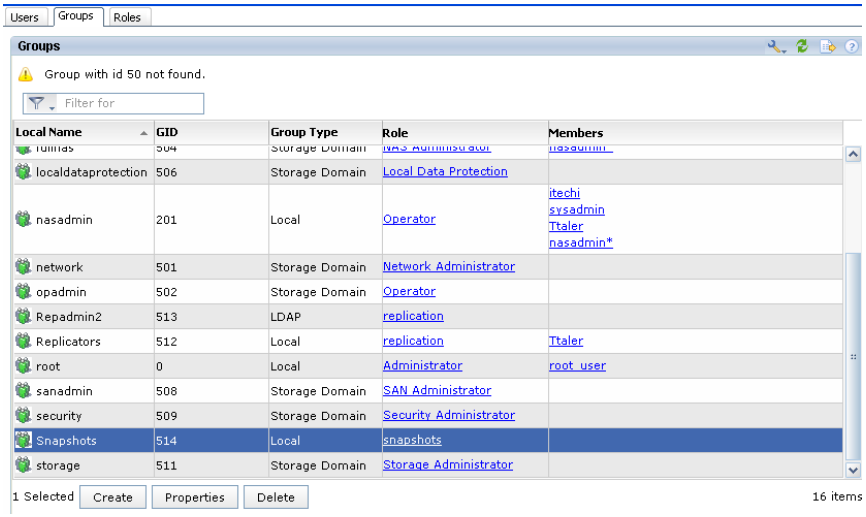
| Step | Action |
|---|---|
| 3 | **Verify Role configuration:**<br><br>The snapshots role should appear under the Roles tab in User Customization for File window.<br><br>  |
| 4 | **Create a local Group:**<br><br>• Navigate to **Settings > Security > User Management > User Customization for File > Groups tab**.<br>• Click the **Create** button and create a group according to the following information:<br>Group Name: **Snapshots**<br>GID: **Auto select**<br>Role: **Snapshots**<br>Group Type: **Local only Group**<br>Click **OK**<br><br>  |







EMC² where information lives®

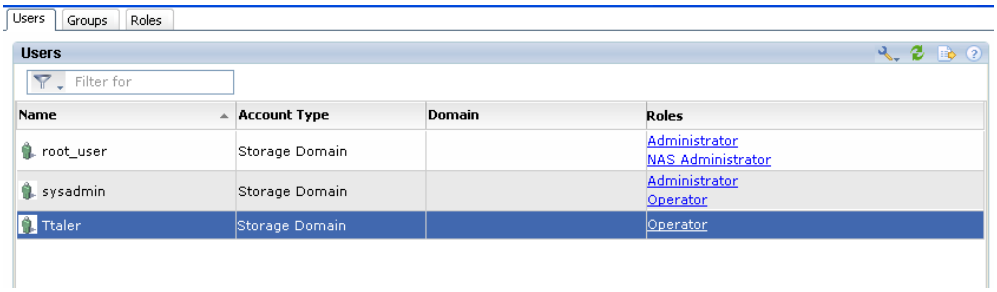
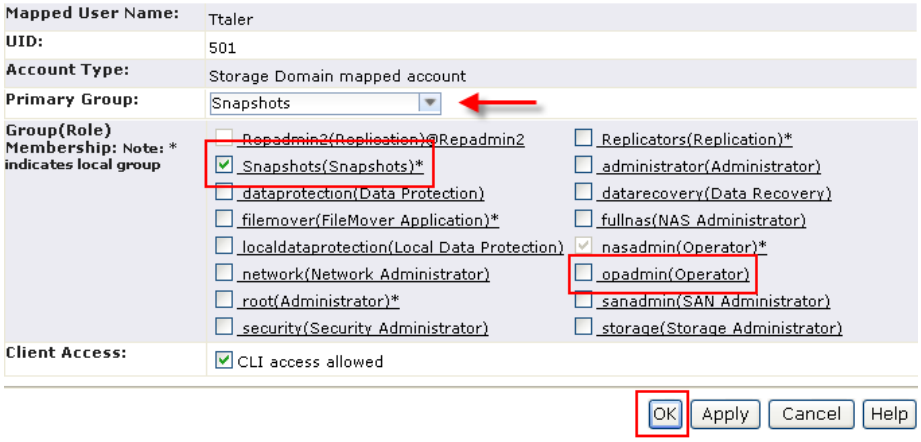
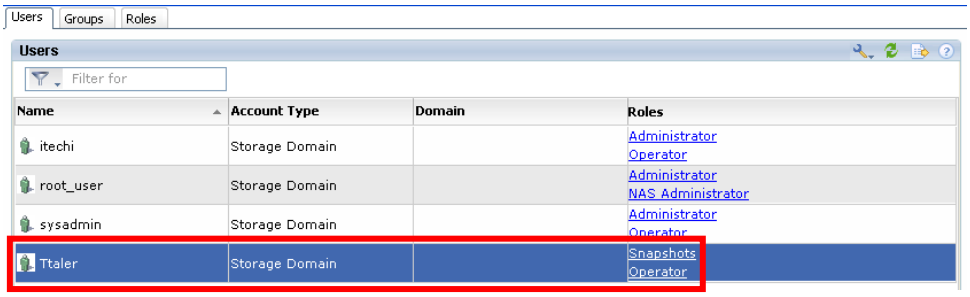
| Step | Action |
|---|---|
| 5 | **Verify Group configuration:**<br><br>The Snapshots group should appear under the Groups tab in User Customization for File window.<br><br>  |
| 6 | **Create a Global user account:**<br><br>• Navigate to **Settings > Security > User Management > Global User Management**.<br>• Click the **Add** button and create a user according to the following information:<br>Username: **Ttaler**<br>Password: **sysadmin1**<br>Confirm Password: **sysadmin1**<br>Storage Domain Role: **Operator**<br>Click **Ok.** At the "add the following user" window click **Yes**. Click **OK**.<br><br> |





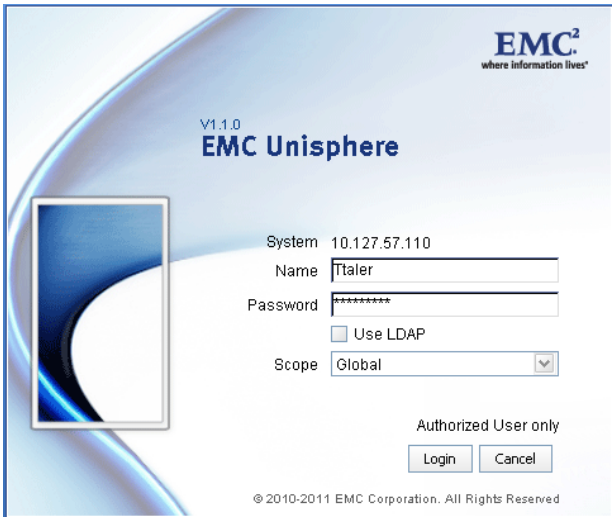
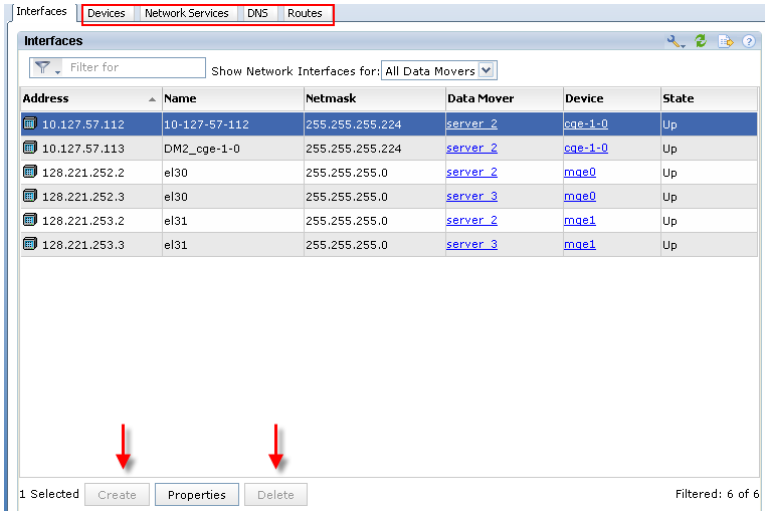


EMC²
where information lives®

| Step | Action |
|---|---|
| 7 | **Add user Ttaler to the Snapshots Group:**<br>• Navigate to **Settings > Security > User Management > User Customization for File > Users tab**.<br>• Double-click the **Ttaler** user account to open the Properties page.<br>• Modify the **Primary Group** field to **Snapshots**.<br>• Select the **Snapshots** local group/role and uncheck **opadmin(Operator)**.<br>• Click **OK**.<br>  <br>  <br>  |



EMC² where information lives®

| Step | Action |
|---|---|
| 8 | **Verify Ttaler authentication:**<br>• Logout from Unisphere and log back in with the new Global user Ttaler (case sensitive) credentials.<br>  <br>• Verify that the new local user account is able to login and does not have creation and modify rights on e.g. network operations like DNS or Routing. From the Dashboard view, select your **VNX** from the All System dropdown lists. Navigate to **Settings > Network > Settings for File**.<br>• All buttons should appear grayed out. The account is also not able to modify any administrative account. Since there is no file system snapshots implemented yet, you can not verify all of access rights for the new local user at this time.<br>• Close Unisphere.<br>  |





*End of Lab Exercise 1*

# Lab Exercise 2: VNX System Configuration

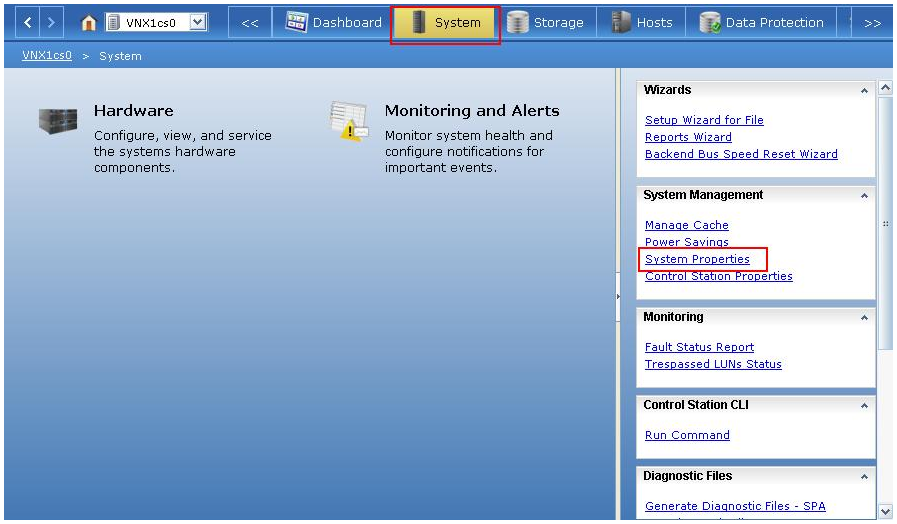
| | |
|---|---|
| **Purpose:** | A new VNX Unified storage system has been deployed. You must now configure and verify the VNX storage system SP (Storage Processor) memory and cache settings for optimal performance. |

| | |
|---|---|
| **Tasks:** | In this lab exercise, you will perform the following tasks:<br>• Enable and disable read and write cache<br>• Configure VNX SP memory for read and write caching<br>• Configure write cache watermarks<br>• Verify SP network configuration |



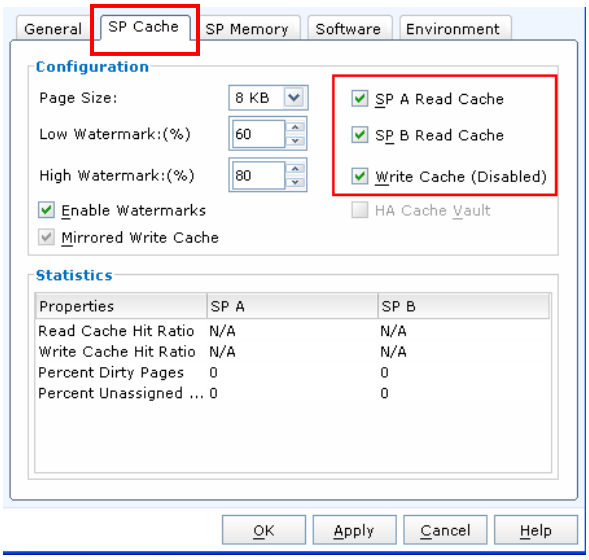
EMC² where information lives®

# Lab 2: Part 1 – Configure VNX SP Memory

| Step | Action |
|---|---|
| 1 | **System Login:**<br>• Login back to Unisphere as **sysadmin**. If a Licensing Window appears click Accept.<br>• From the Dashboard view, select your **VNX** from the All System dropdown lists. Then click the **System** button on the Navigation bar.<br>• Under the System Management menu on the right side of the window, click the **System Properties** link.<br>  |

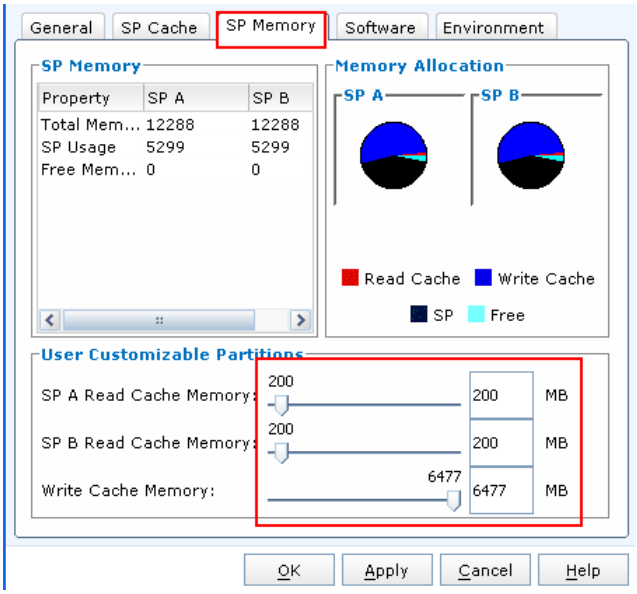


EMC² where information lives®

| Step | Action |
|---|---|
| 2 | **Disable Read and Write Cache:**<br><br>• Click the **SP Cache** tab.<br>• If SPA and SPB **read** cache and/or **write** cache are enabled, disable them by clicking on the check box for each setting (this removes the check marks).<br>  ○ If SPA and SPB read cache are grayed out, disable write cache only.<br>• Click **Apply, Yes, Yes, OK.**<br><br>  <br><br><br>**Note:** If an SP is removed you cannot use Unisphere to set the write cache. |



EMC² where information lives®

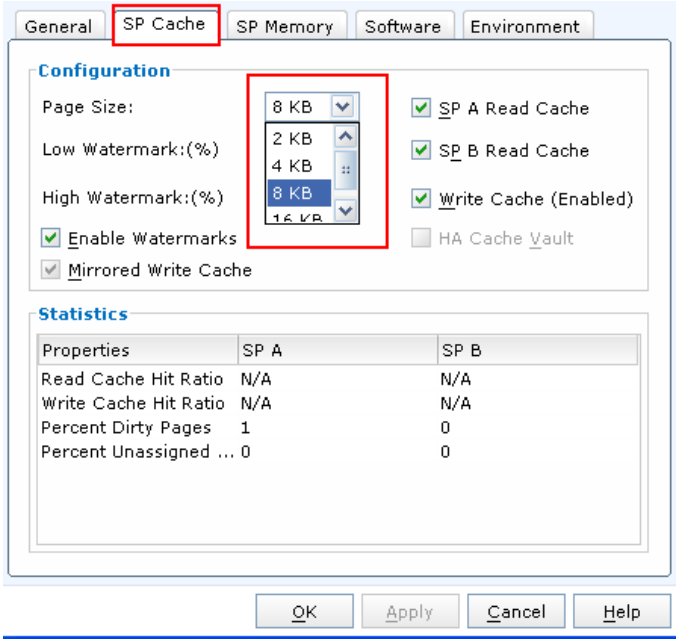
| Step | Action |
|---|---|
| 3 | **Configure SP Memory:**<br><br>• Click on the **SP Memory** tab and note the Total Memory for each SP.<br>• Use the slide bar to experiment with the SPA and SPB Read Cache values and Write Cache values.<br>  ○ Note that you can only raise Read Cache after lowering Write Cache from its maximum value.<br>• Set the values as follows for each SP:<br><br>**Read Cache** = 200MB  **Write cache** = remaining amount or maximum allowed<br><br>  <br><br><br>1. How much memory was left for Write Cache Memory? _____<br><br>2. Can all remaining memory be used for write cache? _____<br><br>3. What value is shown for Total Memory? _____<br><br>• Reconfigure both SPs Read cache to **512MB** and Write cache to remainder and click Apply, Yes, OK.<br>• Click the **SP Cache tab** and **Enable** the Write cache and both SP's Read cache by selecting each checkbox.<br>• Click **Apply, Yes, OK**. |

*End of Lab Exercise 2 Part 1*



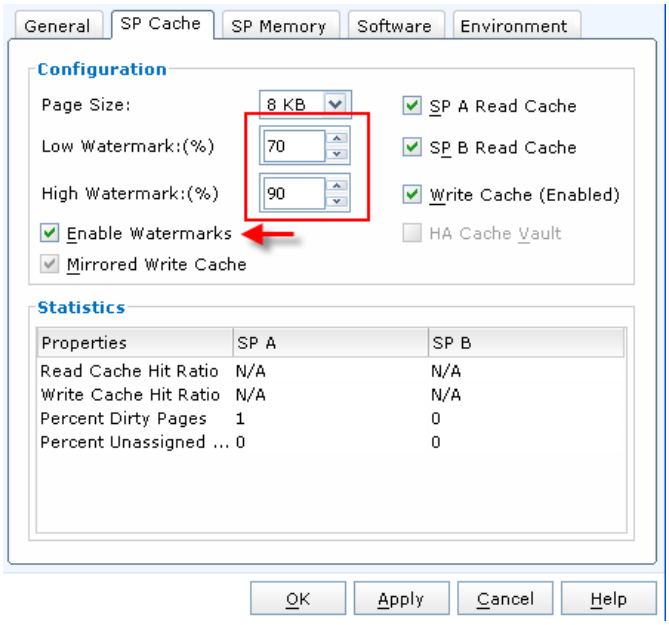
EMC² where information lives®

# Lab 2: Part 2 – Configure SP Cache Settings

| Step | Action |
|---|---|
| 1 | **Verify Cache page size:**<br><br>• Click the **SP Cache** tab.<br>• Under Configuration, select a page size of 8KB using the drop-down lists.<br><br>  <br><br><br>In cases where I/O size is very stable, it is beneficial to set the cache page size to the request size seen by the storage system, the file-system block size or, if raw partitions are used, the application block size. In environments with varying I/O sizes, the 8KB page size is optimal. |
| 2 | **Configure Watermarks:**<br><br>• From the **SP Cache tab**, verify the Enable Watermarks checkbox is checked.<br>• Set the **Low Watermark to 50%** by clicking the up or down arrow of the spin button control as needed.<br>• Set the **High Watermark to 70%** by clicking the up or down arrow of the spin button control as needed.<br>• Click **Apply, Yes, OK**. |



EMC² where information lives®

| Step | Action |
|---|---|
| |  <br>• Uncheck the **Enable Watermarks** box. Note the changes.<br><br>When the Watermarks are disabled, what values do the High and Low Watermarks revert to?<br><br>_____<br><br>• Check the **Enable** Watermarks box.<br>• Change the watermarks back to **70%** for Low and **90%** for High.<br>• Click Apply, Yes, OK.<br>• Close the Systems Properties window.<br><br>**Note:** The Mirrored Write Cache box is grayed-out and cannot be changed. The HA Vault box is also grayed-out. This option determines the availability of write caching when a single drive in the cache vault fails. |

*End of Lab Exercise 2 Part 2*



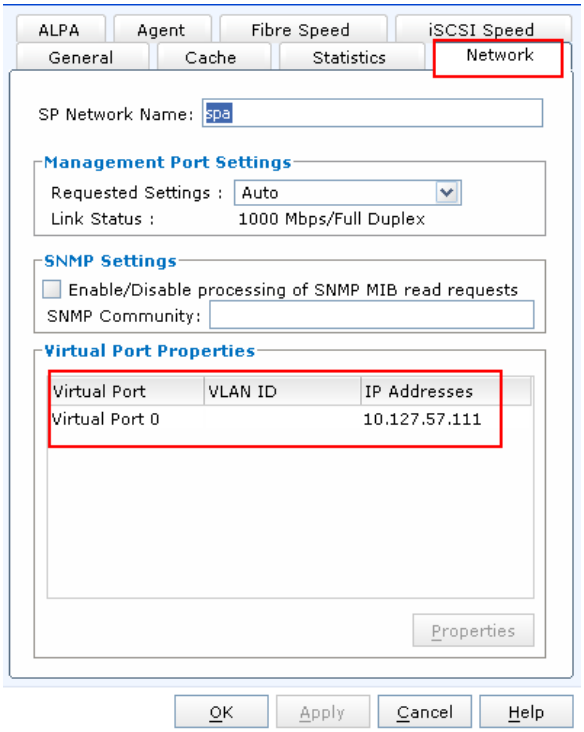
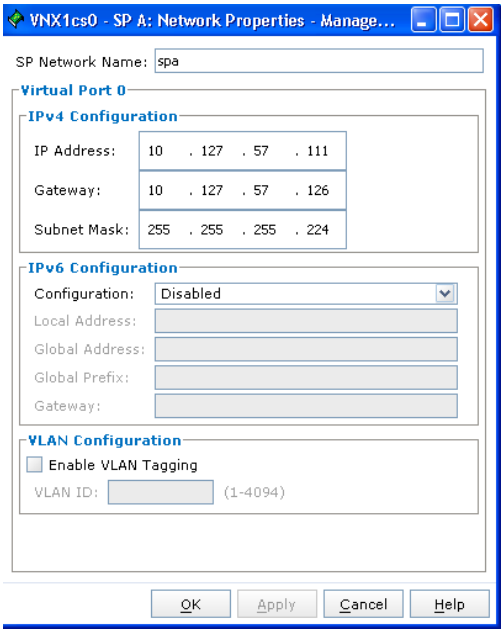
EMC² where information lives®

# Lab 2: Part 3 – Verify SP Network Configuration

| Step | Action |
|---|---|
| 1 | **Access SP network settings:**<br><br>• From the Dashboard view, select your **VNX** from the All System dropdown lists.<br>• Click the **Settings** button on the Navigation bar.<br>• Click the **Edit Network Settings - SPA** link under Network Settings on the right side window<br><br> |
| 2 | **Verify SP network configuration:**<br><br>• Click the **Network** tab.<br>• From Management Port Settings use the dropdown to view the available options and verify the Link Status setting.<br>• From the Virtual Port Properties window, verify that virtual port 0 displays the IP address of SPA (see Appendix).<br>• Click on Virtual Port 0 and select Properties.<br>• Verify that the settings for SPA's Network Name, IP Address, Gateway, and Subnet Mask are correct for your system. |



EMC² where information lives®

| Step | Action |
|---|---|
| |  <br>  <br>• Click **Cancel**, and close Unisphere. |

*End of Lab Exercise 2*



EMC² where information lives®

# Lab Exercise 3: Storage Configuration

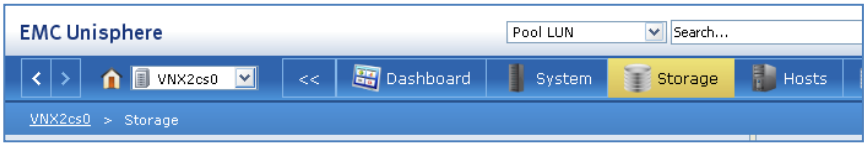
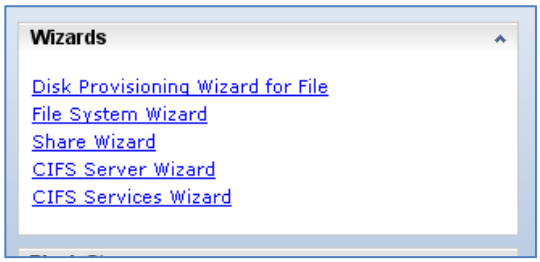
| | |
|---|---|
| **Purpose:** | In this lab, you will provision storage for a VNX Unified system in preparation for configuring file systems and attaching block hosts. |

| | |
|---|---|
| **Tasks:** | In this lab exercise, you will perform the following tasks:<br>• Provision storage for a VNX for File platform<br>• Create Pools and RAID Groups<br>• Create traditional LUNs<br>• Create Thin LUNs and Thick LUNs |



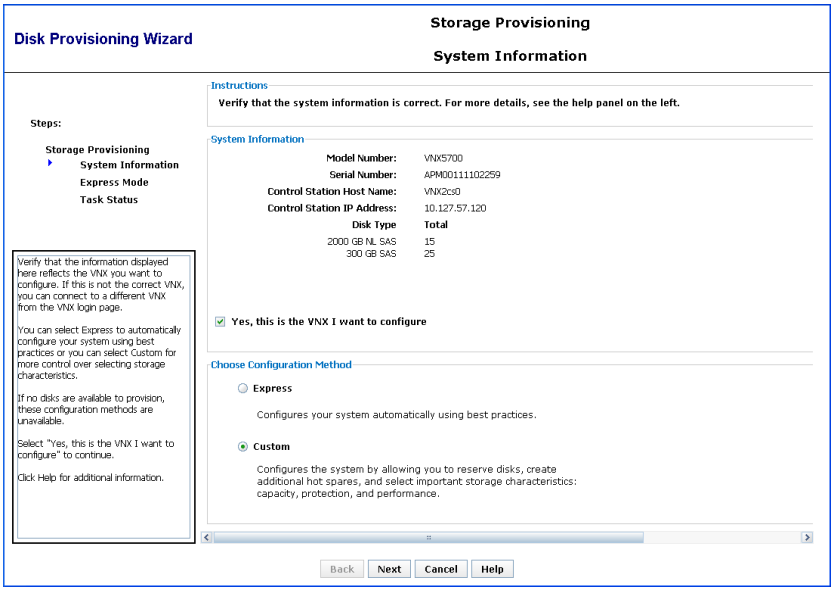
EMC² where information lives®

# Lab 3: Part 1 – Provisioning Storage for VNX File

| Step | Action |
|---|---|
| 1 | **System Login:**<br>• Login to your team's VM Windows host named **Win-X** where **X** is your team number (refer to your team's Appendix) with your **sysadmin** account credential.<br>• From the Dashboard view, select your **VNX** from the All System dropdown lists and click the **Storage** button on the Navigation Bar.<br>  <br>• On the right side of the Unisphere window, select **Disk Provisioning Wizard for File**, under Wizards.<br>  |

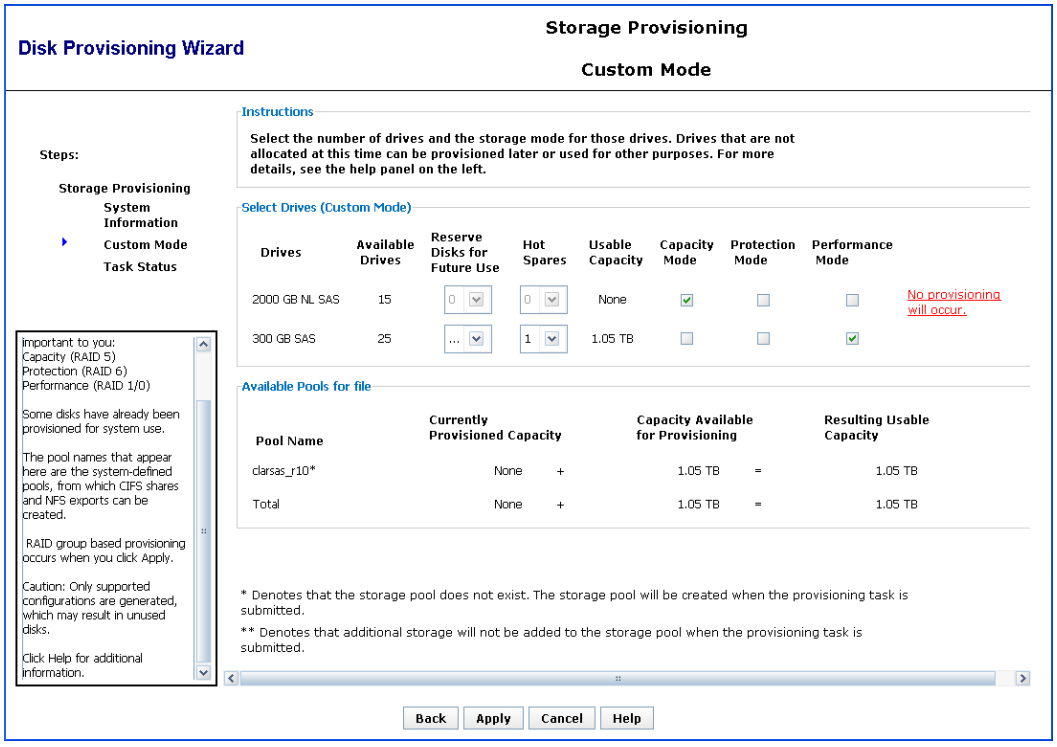


EMC² where information lives®

| Step | Action |
|---|---|
| 2 | **Running the wizard:**<br><br>• Once the wizard has finished loading, review the information listed. Check the **"Yes, this is the VNX I want to configure"** box, and choose the **Custom** configuration method and click **Next**.<br><br>  |

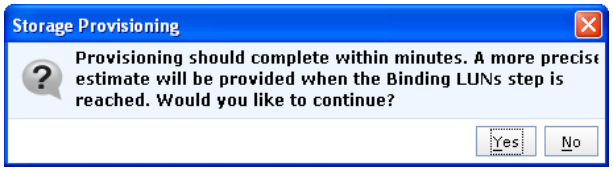


EMC² where information lives®

| Step | Action |
|---|---|
| 3 | **Checking for Understanding:**<br><br>1. Reserve twenty 300 GB SAS drives for future use. Capacity mode is checked by default.<br><br>2. Look at the Available Pools for File area. What is the Pool Name given for Capacity Mode?<br><br>_____<br><br>3. Uncheck Capacity Mode and check Protection Mode for both drive types. Which RAID type is this mode (hint: look at pool name)?<br><br>_____<br><br>4. What is the available pool name when **both** Capacity and Protection Mode are selected?<br><br>_____<br><br>5. Check Performance Mode for both drive types and then uncheck Capacity Mode and Protection Mode for both drive types. What is the pool name here?<br><br>_____<br><br>• Leave Performance Mode selected. Make sure you have twenty 300 GB SAS drives reserved for future use and 1 hot spare.<br>• Click **Apply** to continue.<br><br>  |

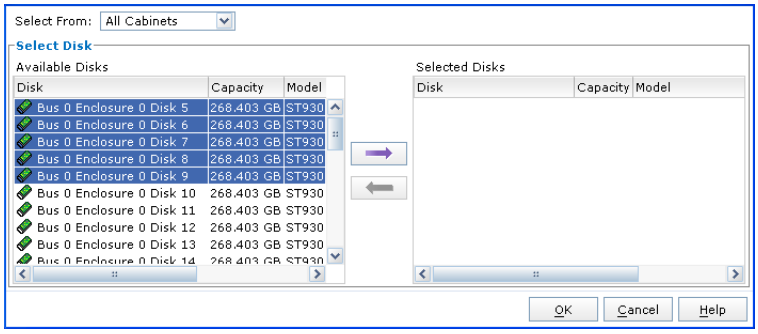


EMC² where information lives®

| Step | Action |
|---|---|
| 4 | **Verification:**<br><br>• After clicking Apply in the previous step, an information window should appear. Click **Yes** to continue.<br><br>  <br><br><br>• When the wizard is complete, click **Finish** to exit out of the wizard.<br>• In Unisphere, navigate to **Storage > Storage Configuration > Storage Pools for File**.<br><br>What is the name of the Storage Pool listed there?<br><br>_____ |

*End of Lab Exercise 3 Part 1*

# Lab 3: Part 2 – Create Pools and RAID Groups

| Step | Action |
|---|---|
| 1 | **Create Pool 0:**<br><br>• From the Dashboard view, select your **VNX** from the All System dropdown lists and navigate to **Storage > Storage Configuration > Storage Pools**.<br>• With the **Pools** tab selected, click **Create**. The system displays a message indicating that with the current configuration, manual disk selection will be used. Click **OK** to clear the message.<br>• The system begins with pool creation using a Storage Pool ID of 0 and RAID Type 5. Click **Select** to manually select the disks for the pool. In the Available Disks window select the following 5 disks - disks **0_0_5, 0_0_6, 0_0_7, 0_0_8, 0_0_9**. Click arrow to move the disks to the Selected Disks window and click **OK**. Click **Apply** to create the pool. Click **Yes** to confirm pool creation. If a Tiering warning appears click **Yes**.<br>  <br>• The pool will be created using the selected disks. Click **OK** to acknowledge the successful operation. |
| 2 | **Create Pool 1:**<br><br>• Using a similar process, create Pool 1 by manually selecting the following 4 disks **0_0_10, 0_0_11, 0_0_12, 0_0_13**. In the **RAID Type:** drop-down select **RAID 1/0** and click **Apply**. Click **Yes** to proceed. If a Tiering warning appears click **Yes.** Click **OK** to acknowledge the successful operation. |
| 3 | **Create RAID Group 5:**<br><br>• In the General tab, change the **Storage Pool Type** option to **RAID Group**. Set the **Storage Pool ID** value to **5**. Keep the RAID Type as **RAID 5**. Manually select the following 5 disks - **0_0_14, 0_0_15, 0_0_16, 0_0_17, 0_0_18** for the RAID Group. Click **Apply, Yes**. Click **OK** to acknowledge the successful operation. |

| | |
|---|---|
| 4 | **Create RAID Group 6:**<br><br>• Create another RAID Group with a **Storage Pool ID** of **6** and a **RAID Type** of **RAID6**. Manually select 8 disks from the second DAE - **1_0_0, 1_0_1, 1_0_2, 1_0_3, 1_0_4, 1_0_5, 1_0_6, 1_0_7.** |
| 5 | **Create a Hot Spare:**<br><br>• Create another RAID Group.<br>• Select **Storage Pool ID** of **20** and select a **RAID Type** of **Hot Spare**. Manually select disk **1_0_14**. Click Apply, Yes. Read the "Create Storage Message".<br><br>What is the name of the Hot Spare LUN that was automatically created?_____<br><br>• Click **OK.** Click **Cancel**. |

*End of Lab Exercise 3 Part 2*



EMC² where information lives®

# Lab 3: Part 3 – Create Traditional LUNs

| Step | Action |
|---|---|
| 1 | **Navigate to LUNs:**<br>• From the Dashboard view, select your **VNX** from the All System dropdown lists and navigate to **Storage > LUNs > LUNs.** |
| 2 | **Create LUNs on RAID Group 5:**<br>• From the LUNs menu click **Create**.<br>• When the Create LUNs window appears, select the **RAID Group** radio button.<br>• Select RAID Type**: RAID 5** from the dropdown if not already selected. This should create LUNs on RAID Group 5.<br>  ○ Consumed capacity should be 0.00 GB<br>• Create **six (6) LUNs** with the following properties:<br>• From the General tab:<br>  ○ User Capacity = **5** GB<br>  ○ LUN ID = **50**<br>  ○ Number of LUNS = **6** (LUNs 50, 51, 52, 53, 54, 55)<br>  ○ Click on Name under LUN Properties and type in **RG5_LUN**<br>  ○ Starting ID = **50**<br>• From the Advanced tab:<br>  ○ Keep all defaults but use the dropdown menus to examine the choices.<br>• Click Apply, Yes, OK. Click Cancel.<br>• Verify the creation of the LUNs |


EMC² where information lives®

| Step | Action |
|---|---|
| 3 | **Create LUNs on RAID Group 6:**<br><br>• From the LUNs menu click **Create**.<br>• Select RAID Type**: RAID 6** from the dropdown. This should create LUNs on RAID Group 6. Follow the same procedures to create six (6) LUNs with the following properties on RG6.<br>• From the General tab:<br>  ○ RAID Type = **RAID6: Dual Parity**<br>  ○ Storage Pool for New LUN = **6**<br>  ○ User Capacity = **6** GB<br>  ○ LUN ID = **60**<br>  ○ Number of LUNS = **6** (LUNs 60, 61, 62, 63, 64, 65 )<br>  ○ Click on Name under LUN Properties and type in **RG6_LUN**<br>  ○ Starting ID = **60**<br>• From the Advanced tab, keep all defaults.<br>• Click Apply, Yes, OK.<br>• Verify the creation of the LUNs.<br><br>How did SP ownership differ between RAID Group 5 and RAID Group 6? _____ |
| 4 | **Create LUN Folders:**<br><br>• Navigate to **Storage > LUNs > LUN Folders**.<br>• Select **Create** and name the folder **RG5**. Click OK, Yes, OK.<br>• Once created, click RG5 and select **Properties**. Then select the **LUNs** tab.<br>• From the **Available LUNs** window, expand the tree for each SP and locate all the **RG5 LUNs (50, 51, 52, 53, 54, and 55)** and click **Add** to move them to the **Selected LUNs** window. Then click OK, Yes, OK.<br><br>• Select **Create** and name the folder **RG6**. Click OK, Yes, OK.<br>• Once created, click RG6 and select **Properties**. Then select the **LUNs** tab.<br>• From the **Available LUNs** window, expand the tree for each SP and locate all the **RG6 LUNs (60, 61, 62, 63, 64, and 65)** and click **Add** to move them to the **Selected LUNs** window. Then click OK, Yes, OK.<br>• Verify you have a total of six (6) LUNs in each folder. |

*End of Lab Exercise 3 Part 3*



EMC² where information lives®

# Lab 3: Part 4 – Create Thick and Thin LUNs

| Step | Action |
|---|---|
| 1 | **Navigate to LUNs:**<br>• From the Dashboard view, select your **VNX** from the All System dropdown lists and navigate to **Storage > LUNs > LUNs.** |
| 2 | **Create Thick LUNs on Pool 0:**<br>• From the LUNs window, click Create. Click **Pool**.<br>• From the **RAID Type** dropdown lists, select **RAID 5**. That should change the **Storage Pool for new LUN** to **Pool 0**.<br>• Create **two (2) Thick LUNs** with the following properties:<br>• From the General tab:<br>  ○ User Capacity = **5GB**<br>  ○ LUN ID = **0**<br>  ○ Number of LUNS = **2**<br>  ○ Click on the Name radio button under the LUN Name and type in **T0_ LUN**<br>  ○ Starting ID = **0**<br>  ○ Note: The Thin checkbox is unchecked so the LUNs you are creating will be Thick LUNs.<br>  ○ Note: **Thick (T) LUNs** are synonymous with Fully Allocated Pool LUNs<br>• Click Apply, Yes, OK. |
| 3 | **Create Thin LUNs on Pool 0:**<br>• Create **two (2) Thin LUNs** on Pool 0 with the following Properties:<br>• From the General tab.<br>  ○ Check the Thin checkbox<br>  ○ User Capacity = **10GB**<br>  ○ LUN ID = **2**<br>  ○ Number of LUNS = **2**<br>  ○ Click on the Name radio button under the LUN Name and type in **t0_ LUN**<br>  ○ Starting ID = **2**<br>  ○ Note: **Thin LUNs** will be represented by **(a small "t" in the naming you assigned. Example: t0_ LUN)**<br>• Click Apply, Yes, OK. Click Cancel. |
| 4 | **Verify LUN creation:**<br>• From the LUNs view, verify that the four (4) LUNs have been created.<br>• For each LUN, click Properties and note which SP owns each LUN. |

| Step | Action |
|---|---|
| 5 | **Create Thick LUNs on Pool 1:**<br><br>• From the LUNs window, click Create. Click **Pool**.<br>• From the **RAID Type** dropdown lists, select **RAID 1/0**. That should change the **Storage Pool for new LUN** to **Pool 1**.<br>• Create **two (2) Thick LUNs** with the following properties:<br>• From the General tab:<br>  ○ User Capacity = 10GB<br>  ○ LUN ID = **4**<br>  ○ Number of LUNS = **2**<br>  ○ Click on the Name radio button under the LUN Name and type in **T1_ LUN**<br>  ○ Starting ID = **4**<br>• Click Apply, Yes, OK. |
| 6 | **Create Thin LUNs on Pool 1:**<br><br>• Create **two (2) Thin LUNs** with the following properties:<br>• From the General tab:<br>  ○ Check the Thin checkbox<br>  ○ User Capacity = 5GB<br>  ○ LUN ID = **6**<br>  ○ Number of LUNS = **2**<br>  ○ Click on the Name radio button under the LUN Name and type in **t1_ LUN**<br>  ○ Starting ID = **6**<br>• Click Apply, Yes, OK. Click Cancel. |
| 7 | **Verify LUN Creation:**<br><br>• Verify you have a **total** of eight (8) LUNs created - four (4) on each Pool.<br>  ○ Four Thick (T) LUNs and four Thin (t) LUNs |



EMC² where information lives®

| Step | Action |
|---|---|
| 8 | **Navigate to the Storage Pools:**<br><br>• Click Storage > Storage Configuration > Storage Pools from the Navigation bar.<br>• Click **Pools**. For each Pool, click **Properties**.<br><br>How much space is Consumed on each Pool? _____<br><br>• Under the **Pools** section is the **Details** section. Click **Pool 0** and under Details click the **Pool LUNs** tab. Make sure the **Usage** is **All User LUNs**. Select **T0_LUN_0** and click **Properties**.<br><br>Note the User and Consumed Capacities._____<br><br>• Repeat the process for **t0_LUN_2**<br><br>• Note: User Capacity is the size of the LUN that is presented to the host. Consumed Capacity is user capacity to which the host has written data. Thin LUN consumed capacity and rate of consumption can vary depending on the attached host file system or application using the LUN. This is a normal condition typical of most thin provisioning services. |
| 9 | **Create LUN Folders:**<br><br>• Navigate to **Storage > LUNs > LUN Folders**.<br>• Select **Create** and name the folder **Pool 0**. Click OK, Yes, OK.<br>• Once created, click Pool 0 and select **Properties**. Then select the **LUNs** tab.<br>• From the **Available LUNs** window, expand the tree for each SP and locate all the **Pool 0 LUNs (T0_LUN_0, T0_LUN_1, t0_LUN_2, t0_LUN_3)** and click **Add** to move them to the **Selected LUNs** window. Then click OK, Yes, OK.<br><br>• Select **Create** and name the folder **Pool 1**. Click OK, Yes, OK.<br>• Once created, click Pool 1 and select **Properties**. Then select the **LUNs** tab.<br>• From the **Available LUNs** window, expand the tree for each SP and locate all the **Pool 1 LUNs (T1_LUN_4, T1_LUN_5, t1_LUN_6, t1_LUN_7)** and click **Add** to move them to the **Selected LUNs** window. Then click OK, Yes, OK.<br>• Verify you have a total of six (4) LUNs in each folder.<br>• Close Unisphere. |

*End of Lab Exercise 3*

**Purpose:**

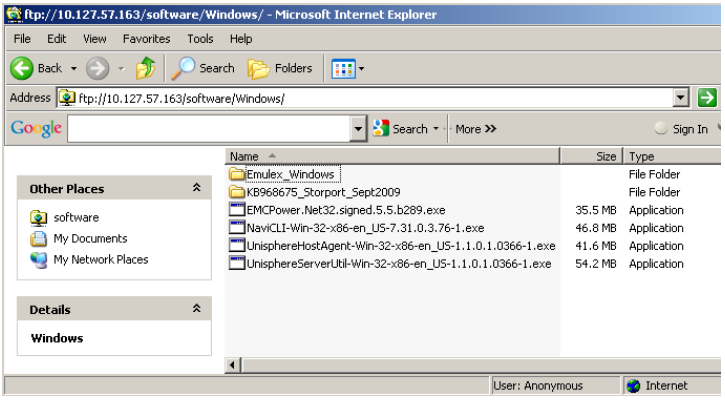
The purpose of this series of labs is to setup your **PHYSICAL Windows hosts** (**SAN-X** where **X** is your team number) with the HBA drivers and array software needed for appropriate communication with the VNX Array. You will also create Storage Groups with EMC Unisphere in order to implement Access Logix and have the hosts access the provisioned luns through logical volume management.

- **Please remember that if you choose to do both sets of labs for Windows and Linux then you will need to remove the Windows Production host from the TeamX_WIN-X storage group in order to put the RedHat Production host into the TeamX_LIN-X storage group and vice-versa <u>each time</u> you need to work on one or the other in a lab.**
  **This cannot be avoided with physical dual-booted hosts!**

  - There has been a **Course Software Share** set up for your Team on a Linux host at the following address: **10.127.XX.163**
    **(Ask your instructor for the correct IP Address which may vary per class)**
  - Your Team may access this server through FTP.

**From Windows:**

- **FTP to the Course Software Share**
  Either ftp://10.127.XX.163/software/
  or from a CLI.
- The credentials (not needed for web browser) are as follows:
  **username**: ftp
  **password**: any number or letter followed by @



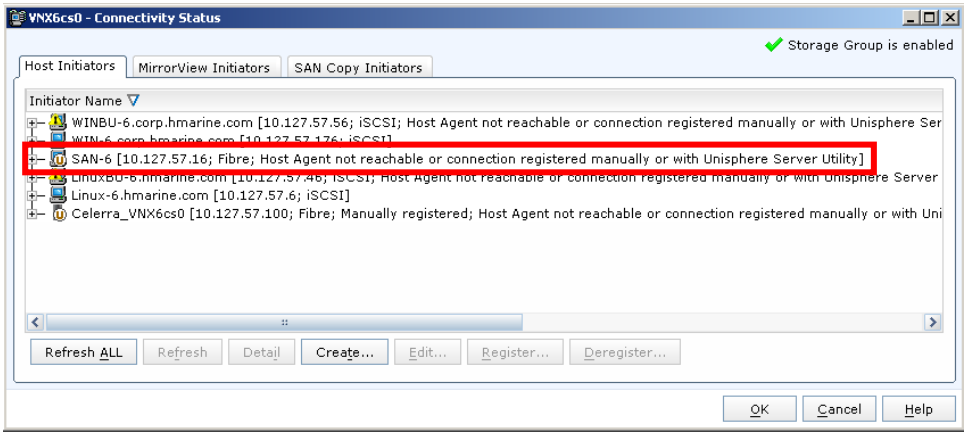

- **If you choose to use the CLI then you must switch over to Binary "bin" in order to download the software in the proper format!**



EMC² where information lives®

| Tasks: | Students perform the following tasks:<br>• Install HBA drivers<br>• Install PowerPath<br>• Install the Unisphere Agent<br>• Install Navisphere Secure CLI<br>• Configuring your VNX system to auto-manage hosts<br>• Create a Storage Group on a VNX storage system with EMC Unisphere<br>• Add LUNs and hosts to a Storage Group with EMC Unisphere |
|---|---|

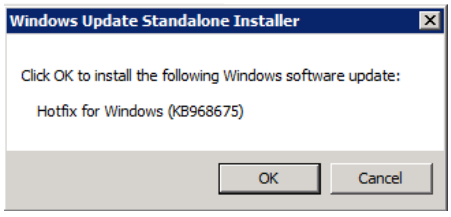
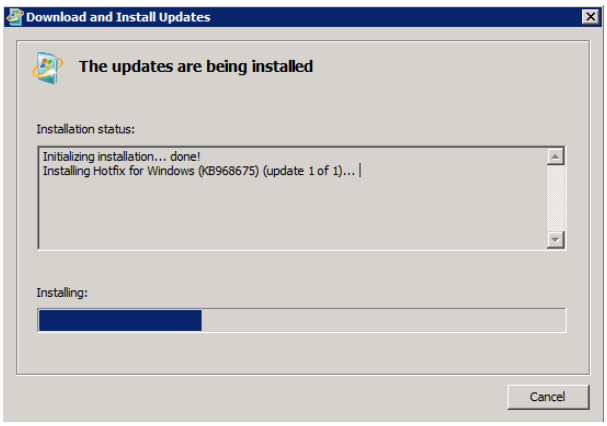
# Lab 4: Part 1 – Installing HBA Drivers - Windows

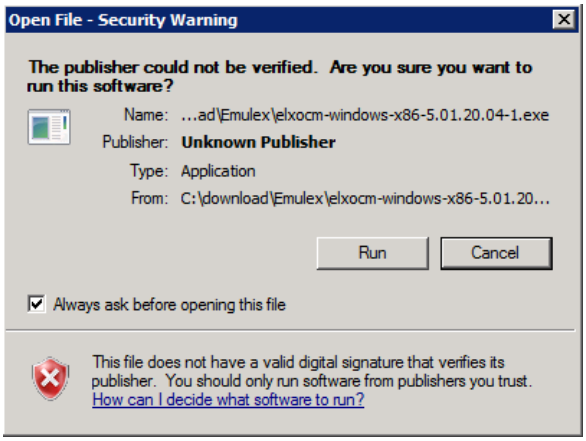
| Step | Action |
|---|---|
| 1 | **System Login:**<br><br>• Open the GUI to your team's **PHYSICAL Windows server** (**SAN-X** where **X** is your team number) through your student web presentation page<br>• Login to Unisphere from your Windows machine with your sysadmin account credential.<br>• From the Dashboard view, select your **VNX** from the All System dropdown lists and click **Hosts** on the Navigation Bar. |
| 2 | **Make sure your host has proper connectivity.**<br><br>• Under Host Management, click on the Connectivity Status and verify your host has registered with the array<br><br>**Example:**<br>  <br>• **Once this is verified move on to the next step.** |
| Note | • **The required software is located in the Course Software Share (please see the beginning of this lab for exact location).**<br>• **You will need the Windows hotfix file as well as the Emulex driver file.**<br>• **Once you have copied over the files locally, if the files are in a zip format, please UNZIP them, if needed, before proceeding!**<br>• **The installation program will install both the drivers and their configuration programs.** |

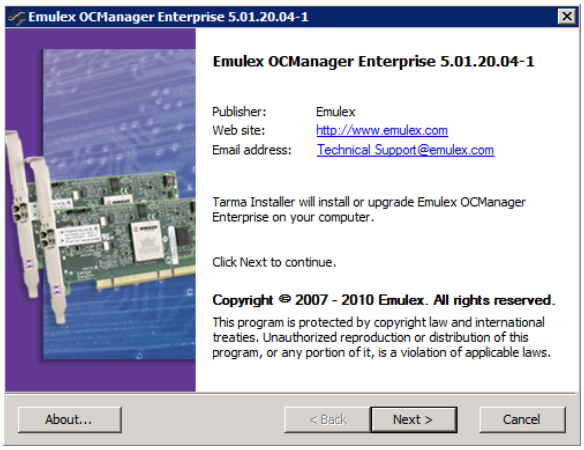
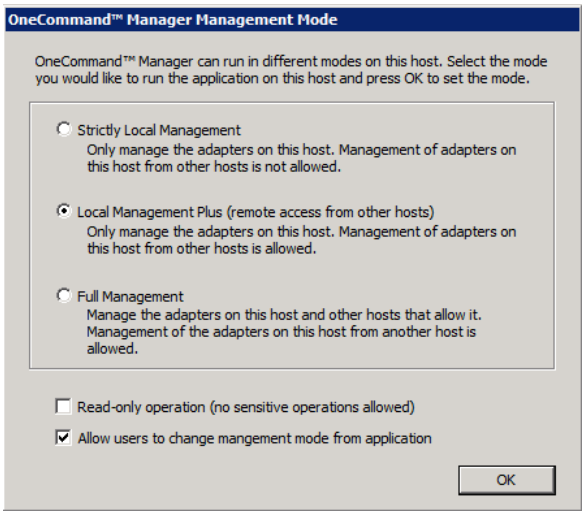
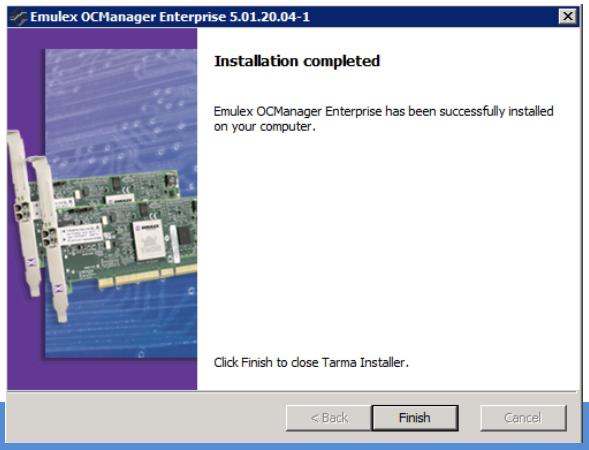




EMC² where information lives®

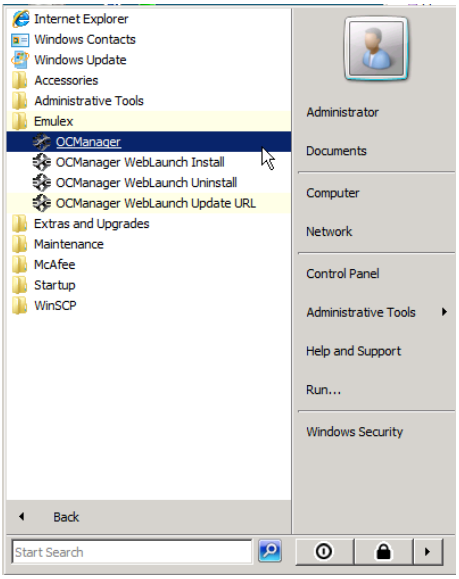
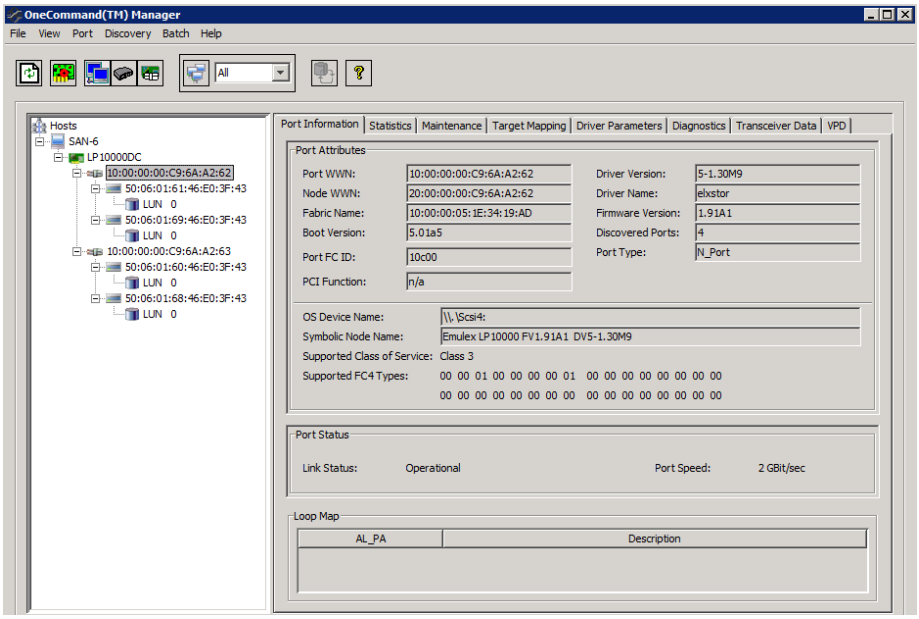
| Step | Action |
|---|---|
| 3 | **For our lab environment, you will need to install a Microsoft Windows 2008 hotfix KB968675_Storport_Sept2009 before you install the HBA drivers.**<br><br>• Navigate to the **Course Software Share**, then to the **software folder** and then to the **KB968675_Storport_Sept2009 folder**<br>• Copy the hotfix locally. Example of the hotfix name: **Windows6.0-KB968675-x86.msu**<br>• Double click on the executable for the hotfix to launch the update<br>• When the information message comes up click ok<br>  <br><br>  <br><br>• *Unlike Windows 2003*, you **WILL NOT** need to reboot the server in order to continue with the HBA driver install. You can move right to the next step! |
| 4 | **Navigate to the Course Software Share, then to the software folder and then to the Emulex_Windows folder**<br><br>• Copy locally the Windows Emulex software, the driver name is in the format of the following example: **elxocm-windows-x86-5.01.20.04-1.exe**<br><br>• Once downloaded, double-click the icon or filename representing the HBA installation program to start the installation. |

| Step | Action |
|---|---|
| 5 | **This will kick off the HBA install program.**<br>• Click **Run** to start the installation process.<br>  |

| Step | Action |
|---|---|
| 6 | **A series of screens will appear displaying information on the program such as where the program will be stored and install screens.**<br><br>• At the opening install screen of the Emulex OCManager Enterprise click next.<br><br>  <br><br><br>• Click Next until you come to the screen that says **Install Options** and click **Finish**.<br>• During the install you will get a popup screen asking you to choose what type of management options you want to implement. Take the defaults.<br><br>  <br><br><br>• At the Installation Completed screen click **Finish**.<br><br>  <br> |

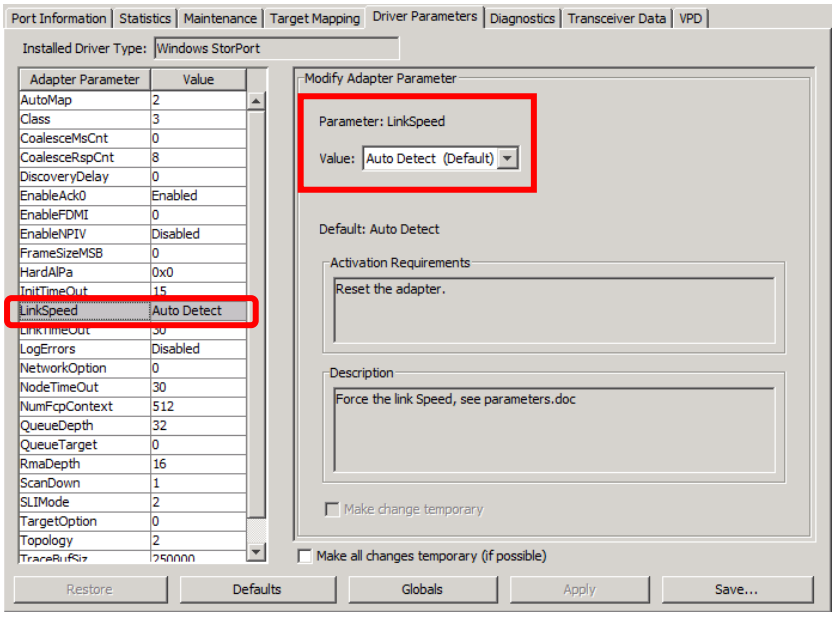


EMC²
where information lives®

| Step | Action |
|---|---|
| 7 | **You have now installed the HBA drivers and the Emulex configuration programs.**<br><br>• We will explore One Command Manager (**OCManager**) as an example. It can be executed from the **Start menu, All Programs** as shown.<br><br>  |
| 8 | **The first screen shows the HBAs found in the host.**<br><br>• Click one of the adapters to review its configuration.<br>• You'll see a series of tabs other than **Port Information**.<br>• Take some time to explore each one.<br><br>  |



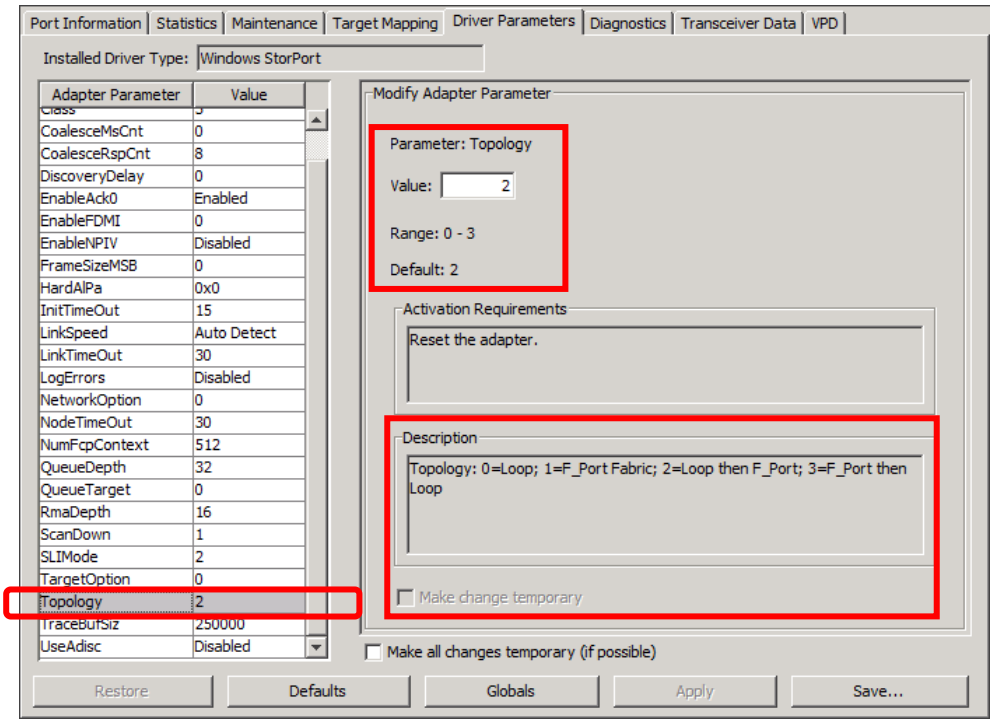
EMC² where information lives®

| Step | Action |
|---|---|
| 9 | Click the **Driver Parameters** tab.<br><br>• In the **Driver Parameters tab**, highlight **Link Speed** and verify it is set for **Auto Detect**.<br><br>  |





EMC² where information lives®

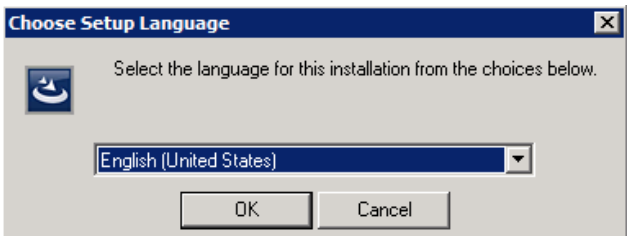
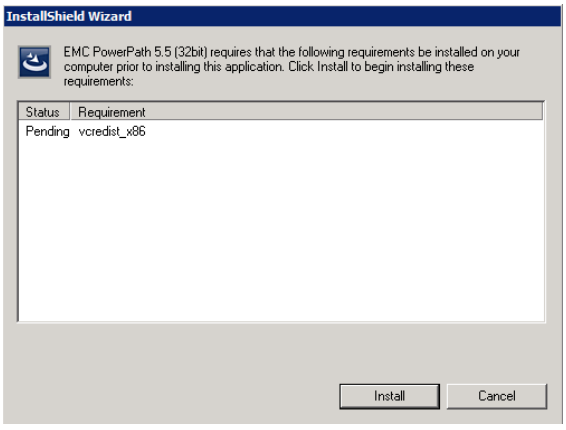
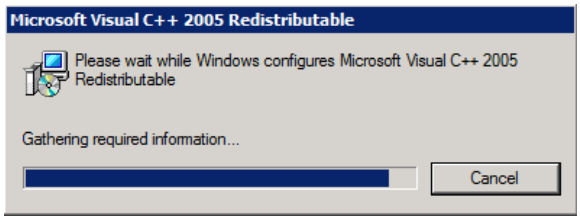
| Step | Action |
|---|---|
| 10 | **Next highlight Topology.**<br><br>• Verify it is set for a value of 2.<br>• Read the other choices and their values under the Description.<br><br>  <br><br><br>• *Note: You should always use EMC-specific drivers. They are installed with settings configured according to EMC best practices. Most manufacturers will have vendor specific drivers available for download.* |
| 11 | **If your Team's setup has more than one physical HBA then you can return to step 8 of this lab and perform the same configuration on the other one if it is present on your host.**<br><br>• Else go to the next step. |
| 12 | **Your HBAs have been installed and setup correctly.**<br><br>• Close the One Command Manager utility. |

*End of Lab Exercise 4 Part 1*



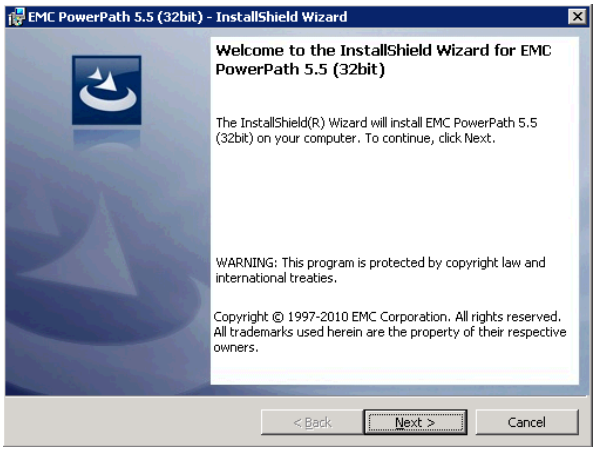
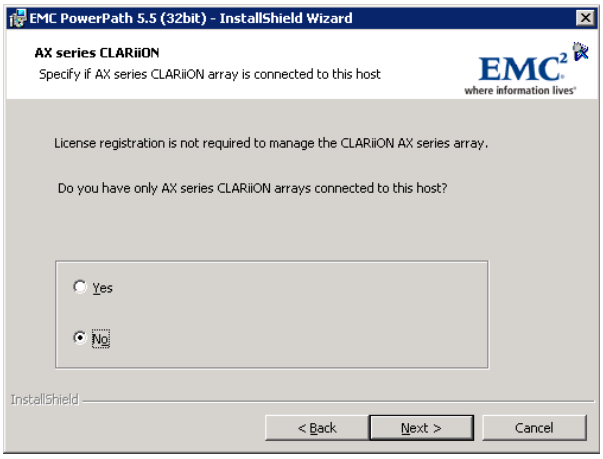
EMC² where information lives®

# Lab 4: Part 2 – Installing PowerPath

| Step | Action |
|---|---|
| 1 | **Install PowerPath**<br><br>• **The required software is located in the Windows folder in the Course Software Share.**<br>• **Copy the file locally. If the files are in a zip format, please UNZIP them before proceeding!**<br>• Double click on the appropriate executable to start the installation.<br>Example: **EMCPower.Net32.signed.5.5.b289.exe**<br>• You will first be asked to choose a language for the installation. Select English (United States) and click OK.<br><br>  |
| 2 | **The Microsoft Visual C++ 2008 Feature Pack Redistributable Package for x86 (vcredist_x86)**<br><br>• If the install prompts you to install the Microsoft Visual C++ 2008 Feature Pack Redistributable Package for x86 (vcredist_x86) then click **Install**, else move to the next step.<br><br>  <br><br>  |

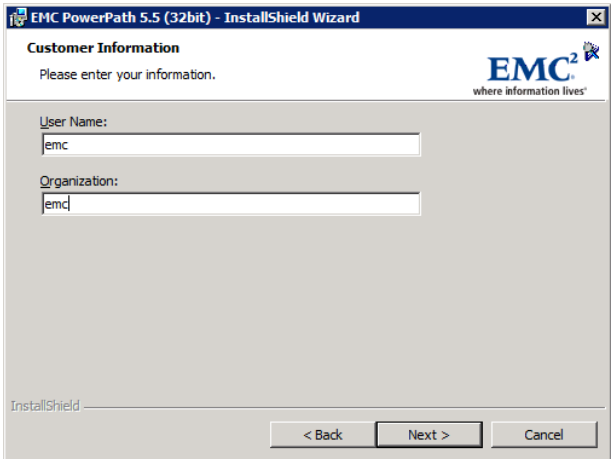
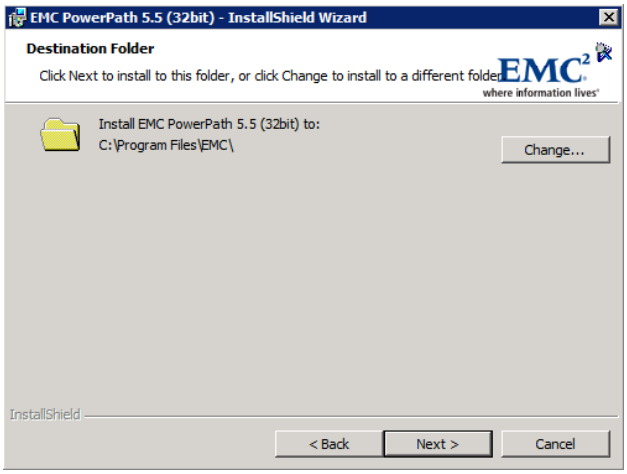


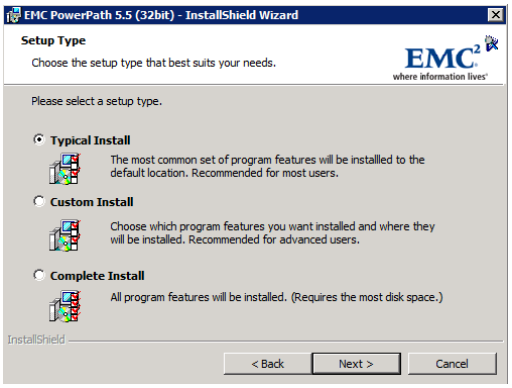
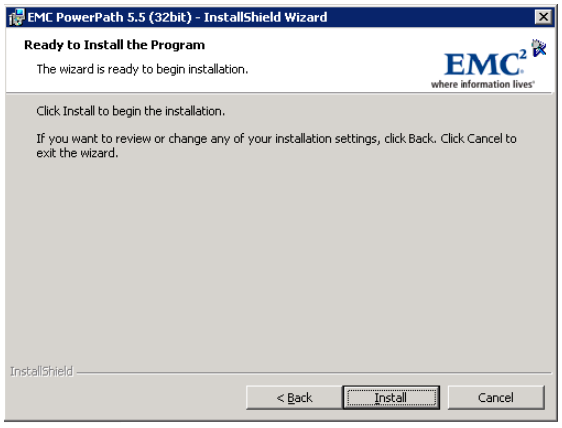
EMC² where information lives®

| Step | Action |
|---|---|
| 3 | **A Prepare to Install screen appears, followed by a Welcome to Install screen.**<br>• Click Next.<br>  |
| 3 | **The legacy AX series Install screen appears.**<br>• Select No and click Next.<br>  |



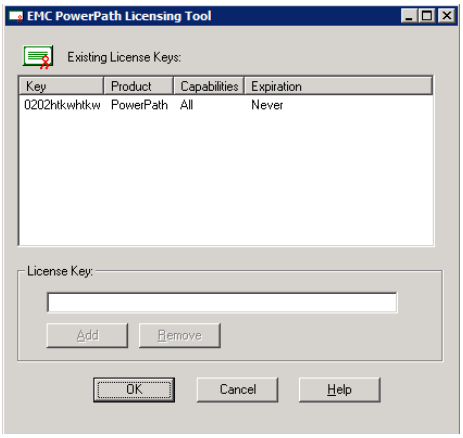
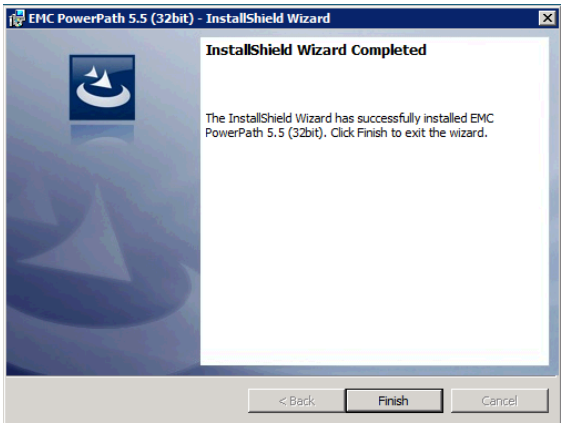
EMC² where information lives®

| Step | Action |
|---|---|
| 5 | **Enter a user name and organization in the Customer Information screen.**<br>• User: EMC and Organization: EMC should work just fine for the purpose of our labs<br>• Click Next to continue.<br>  |
| 4 | **Accept the default folder**<br>• Click **Next** to continue.<br>  |

| Step | Action |
|---|---|
| 5 | **Choose Typical Install (the default)**<br><br>• Click **Next**.<br><br>  |
| 6 | **Click Install to begin installing PowerPath.**<br><br>• Accept any defaults until you get to the License Key display.<br>• If you get a security alerts asking if you want to trust the driver installations then click Yes.<br><br>  |

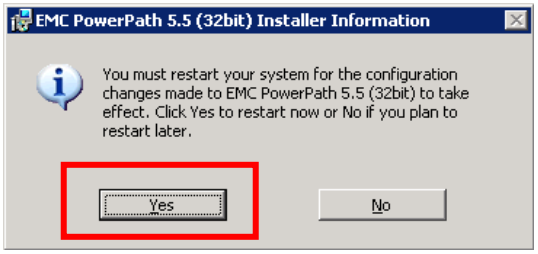


EMC² where information lives®

| Step | Action |
|---|---|
| 7 | **An installing screen appears, followed by a License window.**<br><br>• Enter the license number supplied by the instructor into the License Key field<br>• Or enter **0202htkwhtkw** and click Add.<br>• Note: A separate license key is required for each array the host will be accessing.<br>• This license key should not be given out to anyone.<br>• Click OK to continue.<br><br>  |
| 9 | **Click Finish to complete the installation.**<br><br>  |

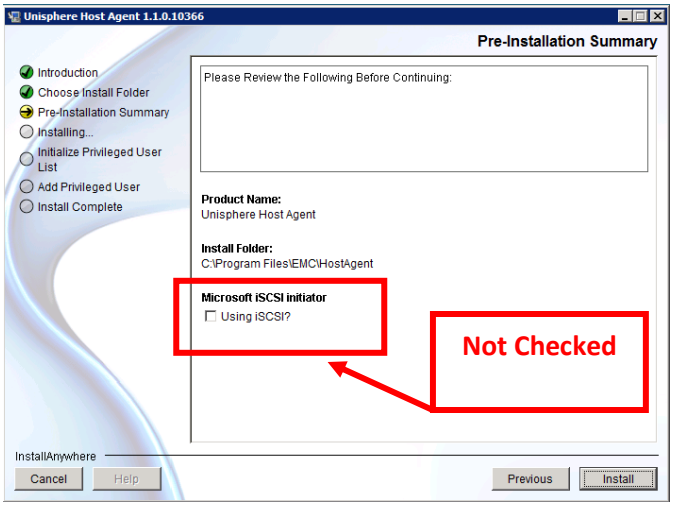


EMC² where information lives®

| Step | Action |
|---|---|
| 10 | **A reboot screen appears**<br><br>• Click **Yes** to reboot.<br>• When the host successfully reboots, and you are logged in once again, move on to the next part of the lab.<br><br>  |

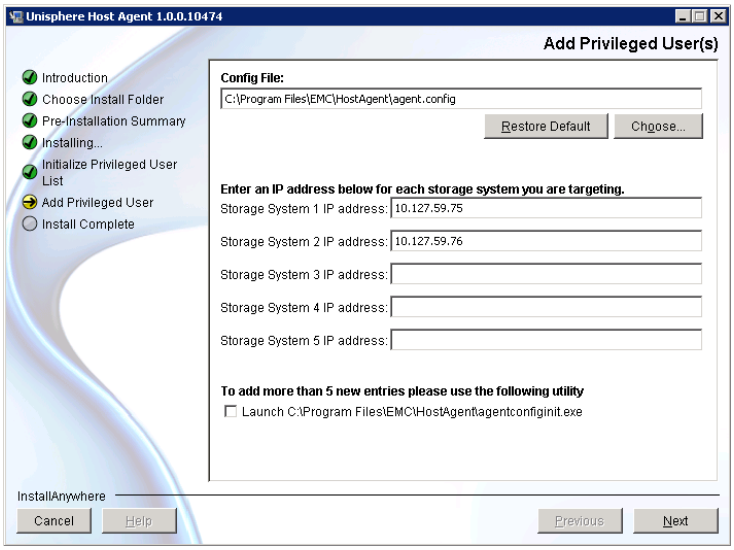
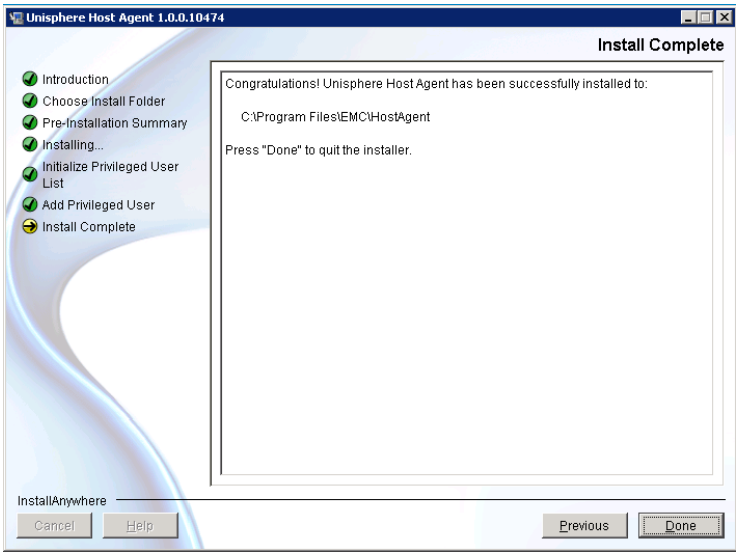
*End of Lab Exercise 4 Part 2*

# Lab 4: Part 3 – Installing the Unisphere Agent

| Step | Action |
|---|---|
| 1 | **Navigate to the Windows folder on the Course Software Share, and copy the Unisphere Host Agent file locally**<br><br>• Next, double-click the Unisphere Host Agent file to launch the install.<br>• The executable name is in the format of the following example: **UnisphereHostAgent-Win-32-x86-en_US-1.1.0.1.0366-1.exe** |
| 2 | **You are asked whether or not you wish to run software from an unknown publisher**<br><br>• Click Next to proceed past the introductory dialogs.<br>• Accept the default installation location, and click Next.<br>• Verify that the check box for the choice **Microsoft iSCSI Initiator – Using iSCSI <u>IS NOT CHECKED</u>**<br>• Click Install to run the installer<br><br>  |



EMC² where information lives®

| Step | Action |
|---|---|
| 3 | **In the Privileged User screen enter in the IP Addresses of your VNX array's SPs**<br>• Both SPA and SPB IP Addresses<br>• Click Next when done<br>  |
| 4 | **Click Done to finish the installation.**<br>  |



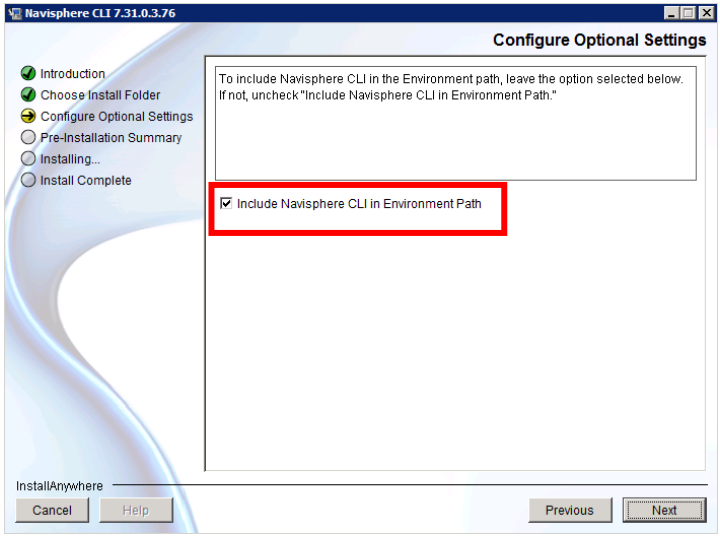


*End of Lab Exercise 4 Part 3*



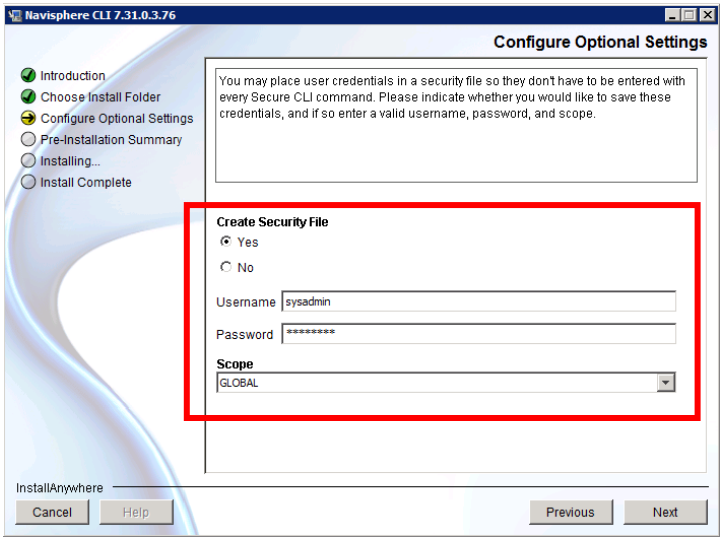
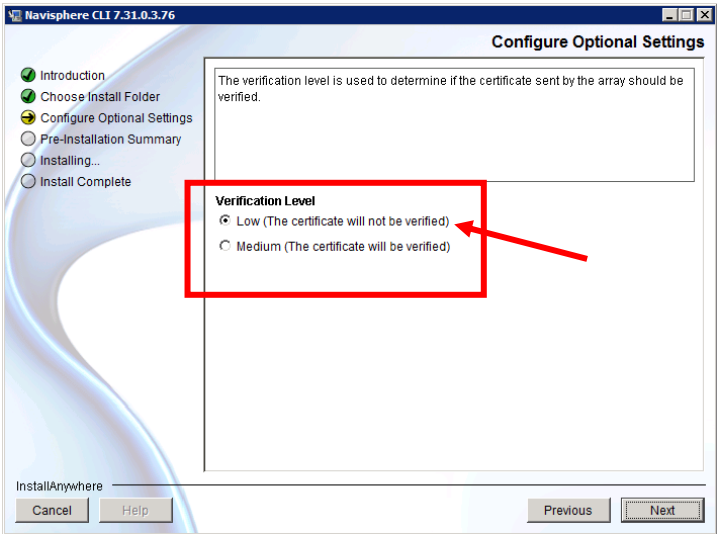
EMC² where information lives®

# Lab 4: Part 4 – Installing Navisphere Secure CLI

| Step | Action |
|---|---|
| 1 | **Navigate to the Windows folder in the Course Software Share.**<br><br>• Double-click the Navisphere Secure CLI file to launch the install.<br>• The executable name is in the format of the following example: **NaviCLI-Win-32-x86-en_US-7.31.0.3.76-1.exe** |
| 2 | **Introductory Dialog**<br><br>• Click Next to proceed past the introductory dialogs.<br>• Accept the default installation location, and click Next. |
| 3 | **Leave the Include Navisphere CLI in Environment Path checkbox checked.**<br><br>• Click Next.<br>• Click Install to run the installer<br><br>  |

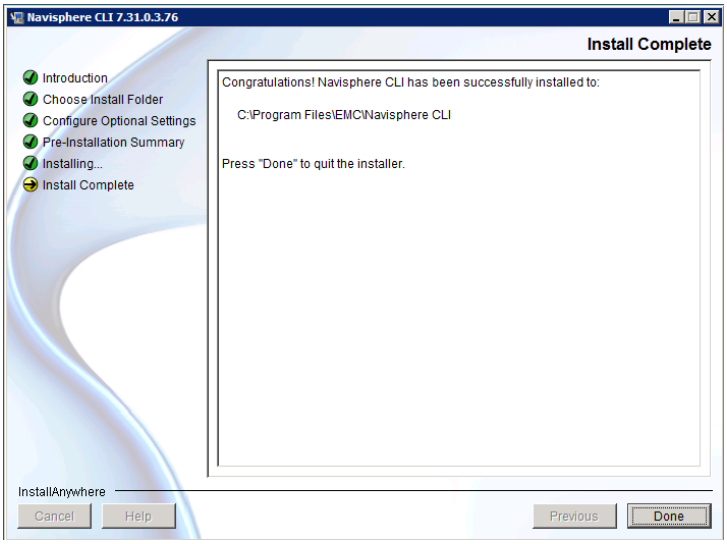


EMC² where information lives®

| Step | Action |
|---|---|
| 4 | **Select Yes when asked if you wish to create a Security File.**<br><br>• Use **Username: sysadmin/ Password: sysadmin /Scope: Global** for the user parameters.<br>• Click Next.<br><br>  |
| 5 | **NaviSecCLI Verification Level settings.**<br><br>• The verification level is used to determine if the certificate sent by the array should or shouldn't be verified.<br>• Accept the default **LOW** setting and click Next.<br><br>  |



EMC² where information lives®

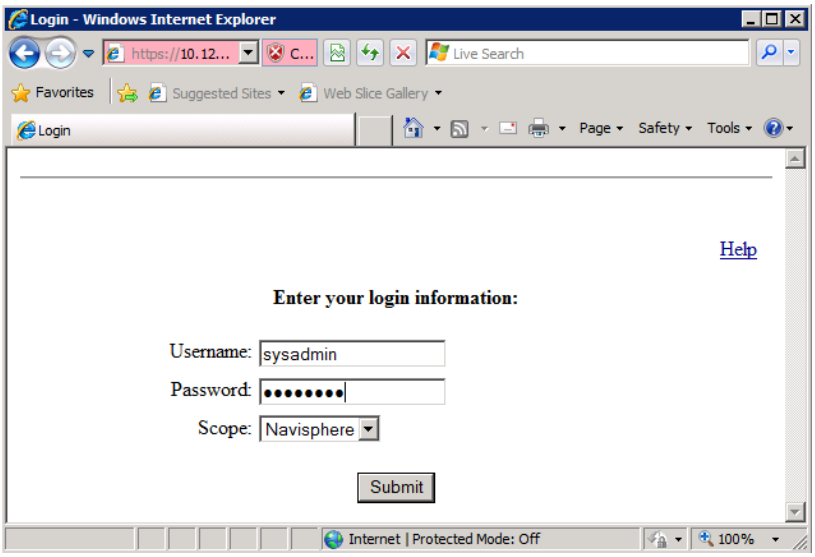
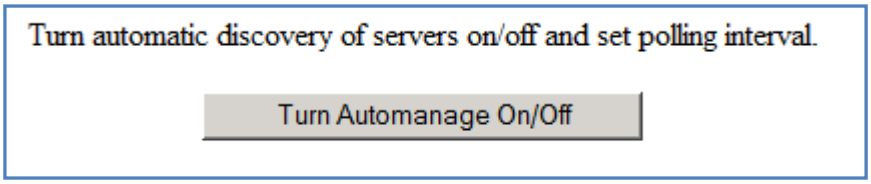
| Step | Action |
|---|---|
| Note | **Besides NaviSecCLI other client software like Unisphere Service Manager (USM) and Unisphere Server Utility will perform certificate verification when connecting to the storage system.**<br><br>**For these applications there are two (2) levels of certificate validation:**<br><br>○ **Low = Bypass Certificate Validation**<br>○ **All certificates will pass the validation.**<br>○ **Default is low so that we will continue to work with existing configurations**<br>○ **Medium = Perform Certificate Validation**<br>○ **Certificates will be validated depending on the type of certificate**<br><br>**Question: What would need to be done if you installed the NaviSecCLI at a LOW setting and later on wished to change it to MEDIUM?**<br><br>_____ |
| 6 | **Next click Install to start the installation.** |
| 7 | **Click Done to finish the installation.**<br><br>  |

*End of Lab Exercise 4 Part 4*



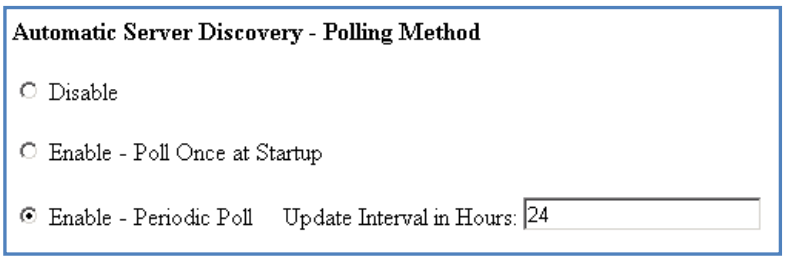
EMC² where information lives®

# Lab 4: Part 5 – Verifying the VNX Array is Configured to Auto-Manage hosts

| Step | Action |
|---|---|
| 1 | **In the address field of Internet Explorer enter the IP address of one of your SPs followed by "/setup" (without quotes of course).**<br>• Then authenticate your management account in Unisphere.<br>  |
| 2 | **In the Setup display scroll down until you find the Turn Automanage On/Off button.**<br>• Click it to enter the settings.<br>  |



EMC² where information lives®

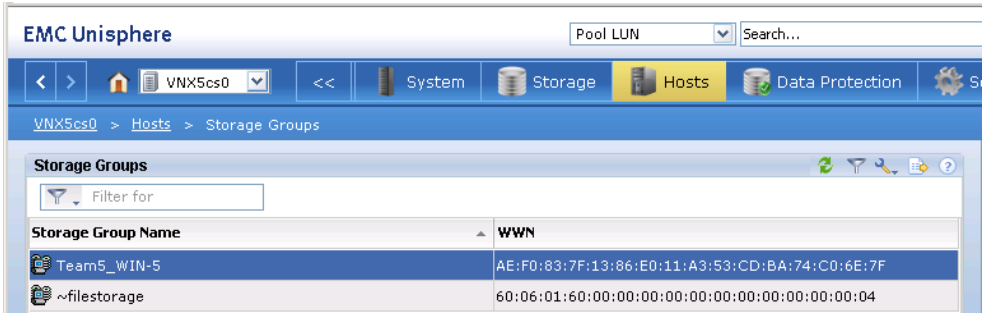
| Step | Action |
|---|---|
| 3 | **Confirm that Auto Manage is enabled.**<br><br>  <br><br><br>**Question: What does this setting do?**<br><br>_____<br><br>_____<br><br>_____<br><br>Hint: Click **Help**. |

*End of Lab Exercise 4 Part 5*



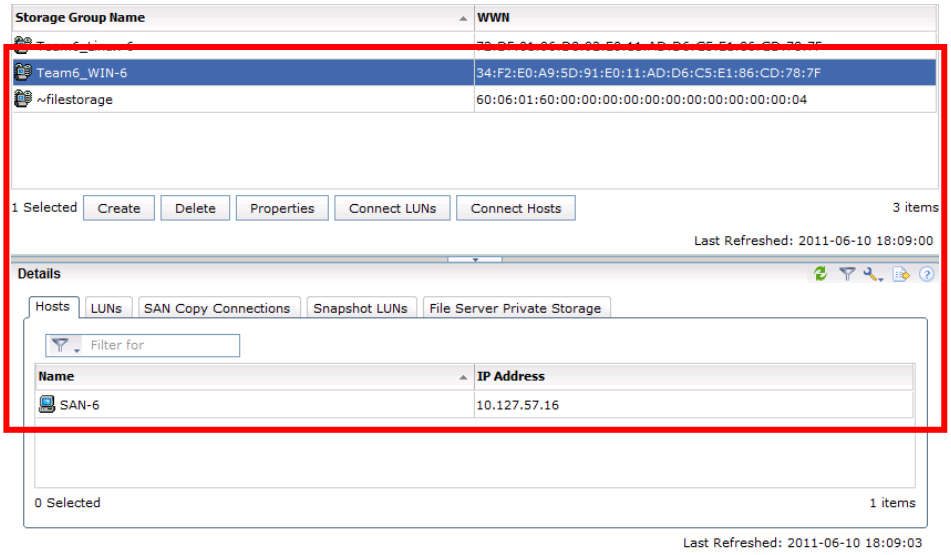
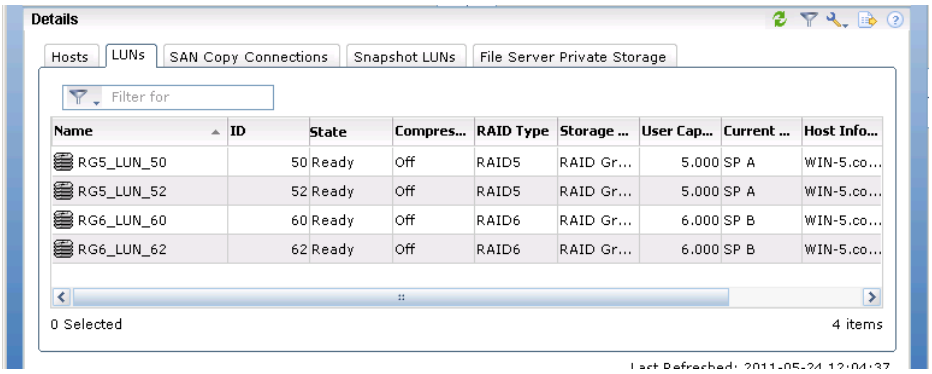
EMC² where information lives®

# Lab 4: Part 6 – Create and Populate Storage Groups with EMC Unisphere - Windows

| Step | Action |
|---|---|
| 1 | **System Login:**<br>• Login to Unisphere from your Windows machine with your **sysadmin** account credential.<br>• From the Dashboard view, select your **VNX** from the All System dropdown lists and , **System** button on the Navigation Bar. |
| 2 | **Verify Storage Groups are Enabled:**<br>• From the **System Management** menu on the right hand of the screen click **System Properties**. This will launch the Storage Systems Properties window.<br>• Click the **General** tab. Under the **Configurations** options, locate the checkbox next to Storage Groups box. This option **enables** storage group capability for the selected storage system. This option cannot be disabled, so the check box appears dimmed and is unavailable when Storage Groups is enabled. |
| 3 | **Create a Storage Group:**<br>• Click **Hosts > Storage Groups** from the navigation bar.<br>• From the **Storage Groups** window, click **Create**.<br>  ○ Note: If there is a storage group already created please ignore it.<br>• Name the **Storage Group: TeamX_WIN-X** where X is your team number. Click **OK.**<br>• A message asks you "**If you would like to add LUNs and connect host to the storage group"**, click **No**.<br>  |
| | **Add LUNs to the Storage Group:**<br>• From the Storage Group window select your **TeamX_Win-X** storage group and click **Properties.**<br>• Click the **LUNs** tab. From the **Available LUNs** window, **expand** the **RG5** and **RG6** containers. Use the scroll bar to see all the available LUNs. Locate the following LUNs **(RG5_LUN_50, RG5_LUN_52, RG6_LUN_ 60, RG_LUN_ 62)** and **add** them to the **Storage group** by selecting the LUN and clicking the **Add** button. Once all the LUNs have been added to the **Selected LUNs** selection click **OK**, **Yes, OK**. |



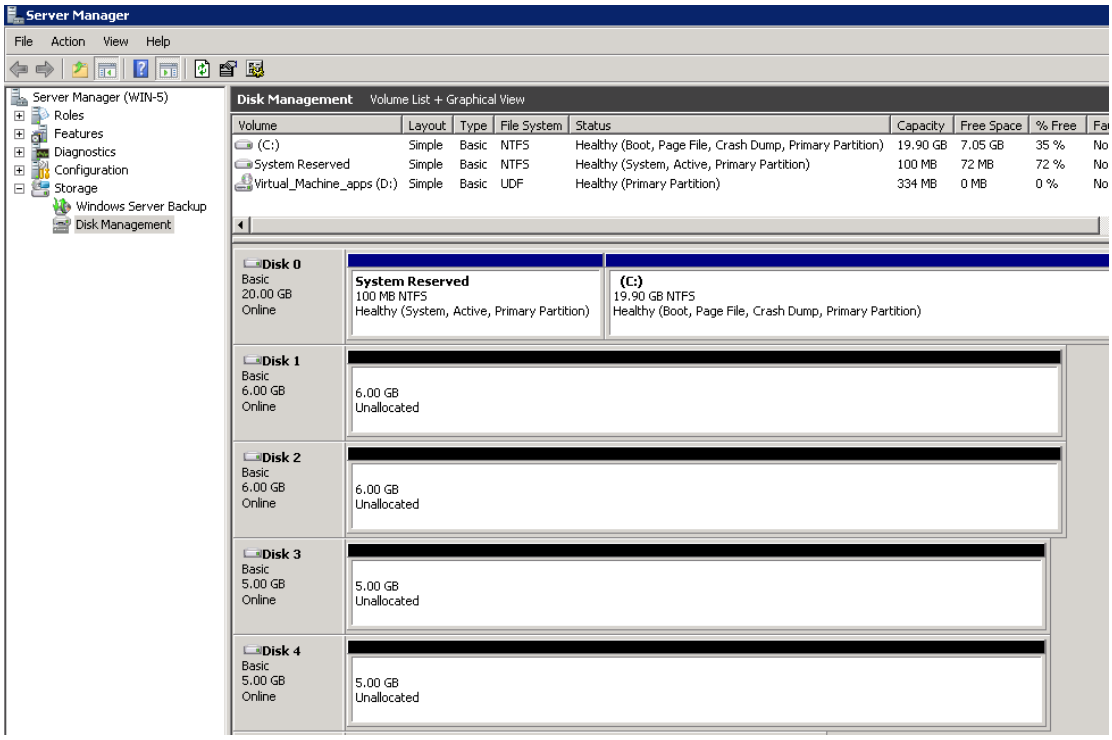
EMC² where information lives®

| Step | Action |
|---|---|
| 4 | **Add a Host to the Storage Group:**<br><br>• From the Storage Group window select your **TeamX_Win-X** storage group and click **Properties.**<br>• Click the **Hosts** tab. Select your **Physical Windows host** (**SAN-X** where **X** is your team number) from the **Available Hosts** pane and click the → to move the hosts to the **Hosts to be Connected** pane. Click **OK, Yes, OK.** |
| 5 | **Verify Storage Group Creation:**<br><br>• From the **Host Management** menu on the right side of the screen click **Update All Hosts**.<br>• Select your **storage system** and click **Poll**. Click **Yes**. After the **Status** reads **Success** followed by the current date and time click Cancel.<br>• From the Storage Group window select your **TeamX_Win-X** storage group**.**<br>• From the **Details** section click the **Hosts** tab and verify that your **SAN-X** host (where X is your team number) is connected<br>• From the **Details** section click the **LUNs** tab and verify that LUNs **RG5_LUN_50, RG5_LUN_52, RG6_LUN_ 60, and RG_LUN_ 62** are connected.<br><br>  <br><br><br>  <br> |

*End of Lab Exercise 4 Part 6*

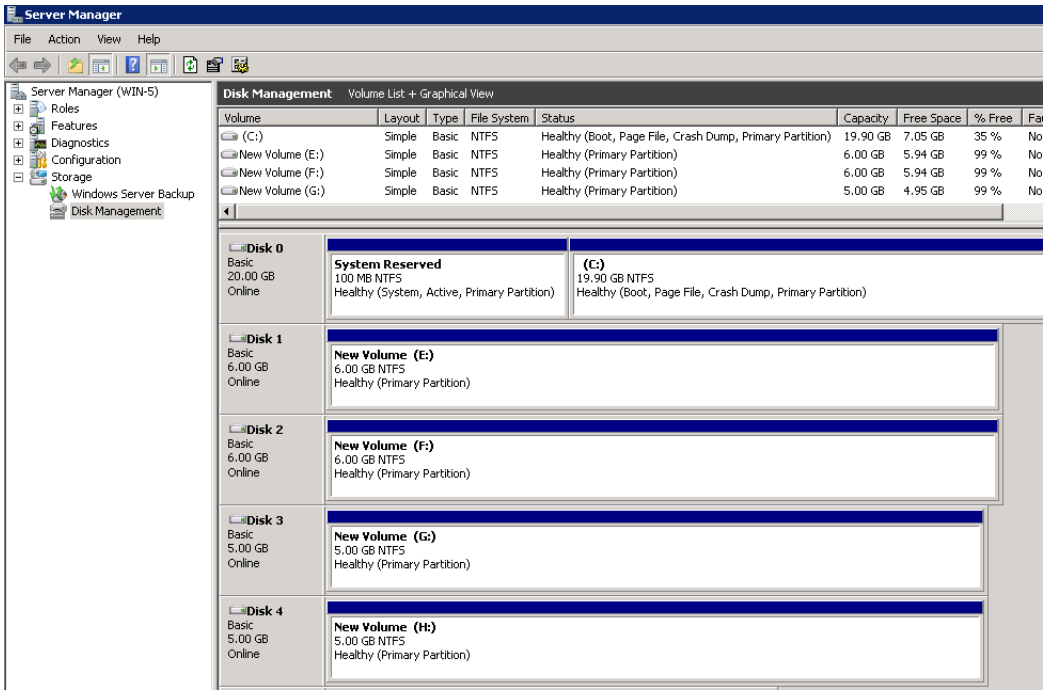


EMC² where information lives®

| Step | Action |
|---|---|
| 1 | **Navigate to the Disk Management menu on your Windows Workstation:**<br><br>• On your **Windows 2008 workstation**, click **Start** and right-click **Computer**. Select **Manage**.<br>• From the **Server Manager** window, expand the **Storage** container and select **Disk Management**.<br>• An Initialize Disk menu will launch.<br>  ○ If you **do not** see four disks that need to be initialized, click Cancel. Select **More Options** on the right side of the menu and click **Rescan Disks**. Once the four disks have been found right click Disk 1 and click Initialize Disk.<br>  ○ If you **do** see four disks that need to be initialized proceed to the next step. |
| 2 | From the **Initialize Disk** menu screen make sure all four disks are **checked** and that the **MBR (Master Boot Record)** is selected. Click OK.<br><br>This will Initialize the disks. Each disk will now be shown as Basic disks that are unallocated.<br><br>  |

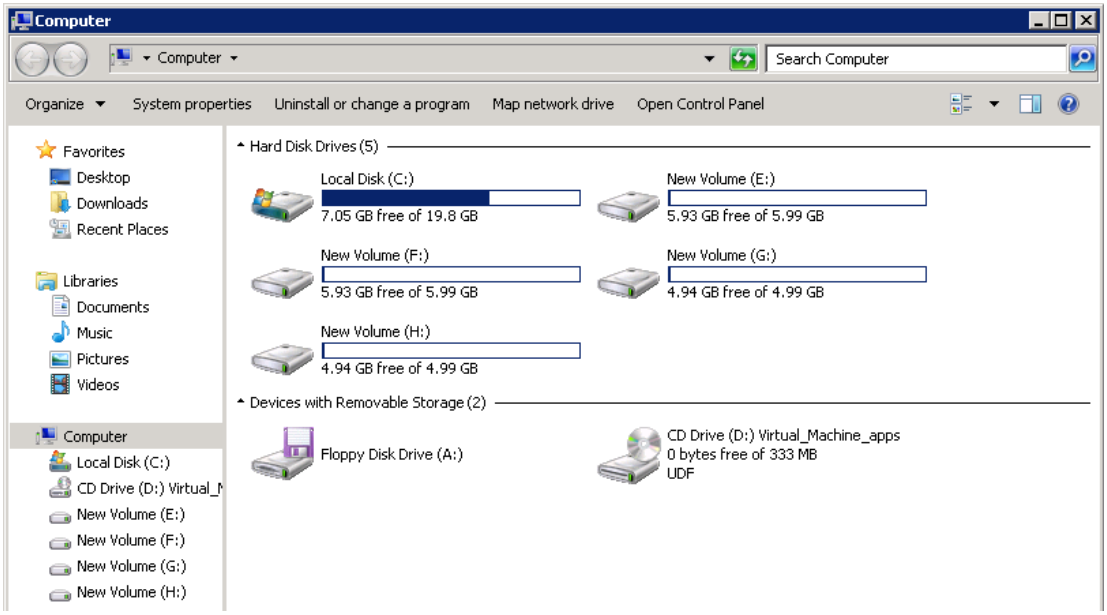


EMC² where information lives®

| Step | Action |
|---|---|
| 3 | **Create New Simple Volumes for each disks:**<br><br>• For the **four unallocated disks** do the following steps:<br>  ○ Right click the **unallocated** section next to a disk and select **Create New Simple Volume.**<br>  ○ The **New Simple Volume Wizard** will appear. Click Next.<br>  ○ For the **Specify Volume Size** make sure the **Simple volume size in MB** matches the **Maximum disk space in MB** amount and click Next.<br>  ○ For **Assign the following drive letter** use the **default** and click Next.<br>  ○ For **Format Partition** use the defaults but choose **Perform a Quick Format** and click Next.<br>  ○ Review your configuration and click **Finish**.<br>• Repeat these steps until all unallocated disks have been made into Simple Volumes.<br>• Close Server Manager<br><br>  |



EMC² where information lives®

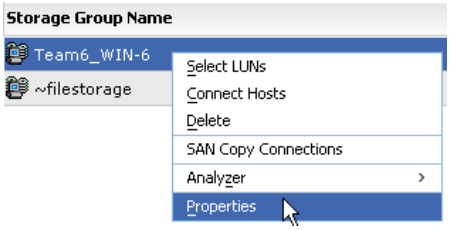
| Step | Action |
|---|---|
| 4 | **Verify Simple Volumes on your Windows Workstation:**<br><br>• On your Windows Server click Start and click Computer. You should now see four new volumes.<br><br>What are the drive letters for the new Volumes?<br>_____<br>  <br> |
| 5 | **Verify the mounts are seen by the VNX:**<br><br>• In Unisphere, navigate to the **Host** tab and on the right hand side under **Host Management** select **Connect Host.**<br>• Type in your Windows Physical Server, (**SAN-X** where **X** is your team number), host **IP address** in the **Enter Host IP Address** field.<br>• Under Volumes on Block Storage Systems verify that your mount volumes are present. |

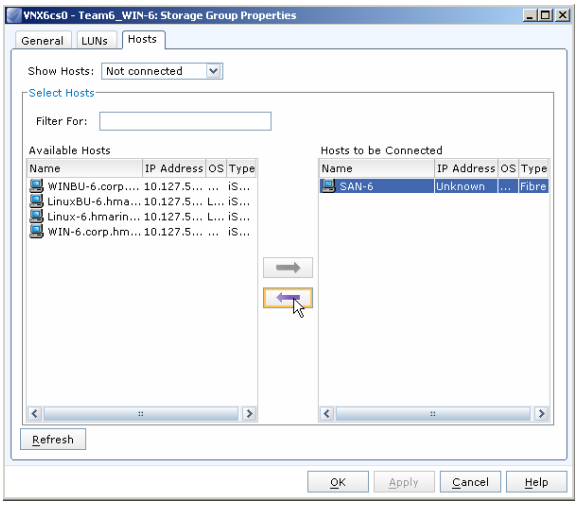
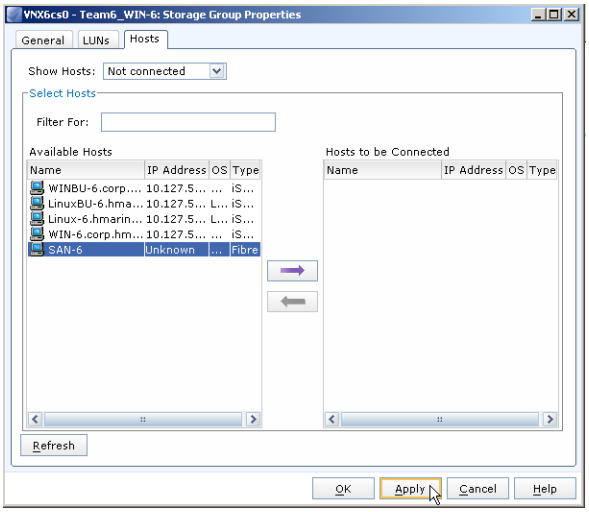
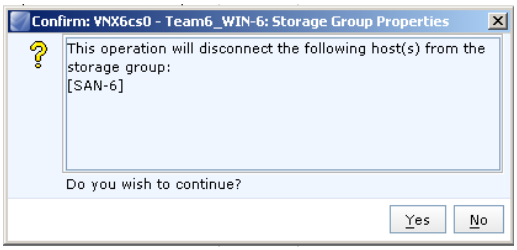
*End of Lab Exercise 4 Part 7*



EMC² where information lives®

# Lab 4: Part 8 – Remove the Windows Host from its Storage Group in prepartion for the Linux Labs

| Step | Action |
|---|---|
| Note | **REMINDER: Please remember that in order to do both sets of labs for Windows *and Linux*, you will need to remove the Windows Production host from the TeamX_WIN-X storage group in order to put the RedHat Production host into the TeamX_LIN-X storage group (yet to be created) and vice-versa each time you need to work on one or the other in a lab.**<br><br>**This cannot be avoided with dual-booted hosts!** |
| 1 | **In Unisphere remove your Windows Host from its storage group.**<br><br>• If needs be, login to Unisphere from your Linux machine with your **sysadmin** account credentials.<br>• From the Dashboard view, select your **VNX** from the All System dropdown lists.<br>• Click **Hosts > Storage Groups** from the navigation bar.<br>• Right-mouse click on your Storage Group and choose **Properties**<br>  |

| Step | Action |
|---|---|
| 2 | **Remove the Windows 2008 server from the "Hosts to be Connected" column**<br>• In the Properties screen remove your Physical Windows 2008, SAN-X, host by hightlighting the host in the "Hosts to be Connected" column and moving it to the "Available Hosts" column.<br>• Click Apply, Yes to the Confirmation Message and OK to the Success Message<br>• Then OK to Close the Storage Group Proprties screen<br>**Example:**<br>  <br><br>  <br><br>  <br> |
| Note | **You are ready to move on to the next part of the Labs on Linux** |

*End of Lab Exercise 4*



EMC² where information lives®

EMC²
where information lives®

**Purpose:**

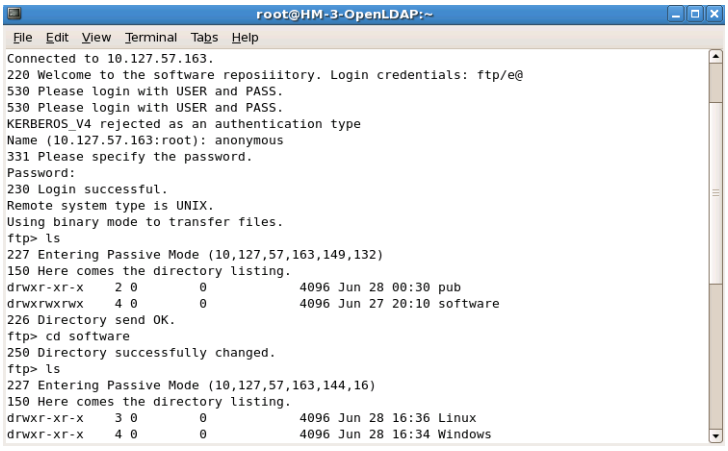
The purpose of this series of labs is to setup your **PHYSICAL Linux host** (**SAN-X** where **X** is your team number) with the proper drivers and software needed for appropriate communication with the VNX Array. You will also create Storage Groups with EMC Unisphere in order to implement Access Logix and have the hosts access the provisioned luns through logical volume management.

- **Please remember that if you choose to do both sets of labs for Windows and Linux then you will need to remove the Windows Production host from the TeamX_WIN-X storage group in order to put the RedHat Production host into the TeamX_LIN-X storage group and vice-versa <u>each time</u> you need to work on one or the other in a lab.**
  **This cannot be avoided with physical dual-booted hosts!**

  - There has been a **Course Software Share** set up for your Team on a Linux host at the following address: **10.127.XX.163**
    **(Ask your instructor for the correct IP Address which may vary per class)**

**From Linux:**

- Open a terminal window and **FTP to the 10.127.XX.163 Course Software Share** host system.
  **username**: ftp
  **password**: any number or letter followed by @


root@HM-3-OpenLDAP:~
File Edit View Terminal Tabs Help
Connected to 10.127.57.163.
220 Welcome to the software reposiiitory. Login credentials: ftp/e@
530 Please login with USER and PASS.
530 Please login with USER and PASS.
KERBEROS_V4 rejected as an authentication type
Name (10.127.57.163:root): anonymous
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> ls
227 Entering Passive Mode (10,127,57,163,149,132)
150 Here comes the directory listing.
drwxr-xr-x 2 0 0 4096 Jun 28 00:30 pub
drwxrwxrwx 4 0 0 4096 Jun 27 20:10 software
226 Directory send OK.
ftp> cd software
250 Directory successfully changed.
ftp> ls
227 Entering Passive Mode (10,127,57,163,144,16)
150 Here comes the directory listing.
drwxr-xr-x 3 0 0 4096 Jun 28 16:36 Linux
drwxr-xr-x 4 0 0 4096 Jun 28 16:34 Windows

- You may wish to create a folder for the appropriate software, cd to that folder and then FTP to the Course Software Share in order to do the FTP get command download to the folder of your choice.

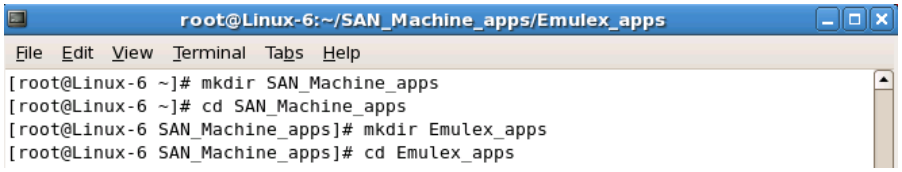


EMC² where information lives®

| | |
|---|---|
| **Tasks:** | Students perform the following tasks:<br>• Install HBA drivers<br>• Install PowerPath<br>• Install the Unisphere Agent<br>• Install Navisphere Secure CLI<br>• Create a Storage Group on a VNX storage system with EMC Unisphere<br>• Add LUNs and hosts to a Storage Group with EMC Unisphere<br>• Identify LUNs assigned to specific hosts<br>• Obtain host LUN status information from EMC Unisphere<br>• Use Linux utilities to make VNX LUNs usable to a Linux host |



EMC² where information lives®

| Step | Action |
|---|---|
| 1 | **Reboot the Windows host into Linux by double-clicking on the boot_rhel4 icon on the desktop.**<br> <br>• Hit the spacebar to close the command prompt and then reboot the Windows server.<br>• Give the server sufficient time to reboot and then open the GUI to your Linux server through your student web presentation page<br>• When the system reboots, ensure the dual boot host is running Linux or has booted into Linux. |
| 2 | **Create a folder called SAN_Machine_apps**<br>• Open a terminal window and create a folder called **SAN_Machine_apps** from the root directory<br>Example:<br>• **`mkdir SAN_Machine_apps`** |
| 3 | **Change directory to the SAN_Machine_apps**<br>• Change directory to the **SAN_Machine_apps** directory<br>Example:<br>**`cd SAN_Machine_apps`** |
| 4 | **Create the Emulex_apps directory** within the **SAN_Machine_apps** directory and change to that directory<br>• Create the /Emulex_apps directory within the SAN_Machine_apps directory and change to that directory<br>Example:<br>  |



EMC² where information lives®

| | |
|---|---|
| 5 | **From the Course Software Share, download the Emulex Drivers from the software\Linux\Emulex_Linux\ directory.**<br><br>• The file is called **`elxocm-rhel5-sles10-5.0.17.4-1.tar`**<br>• Example:<br>`ftp> ls`<br>`227 Entering Passive Mode (10,127,57,163,238,131)`<br>`150 Here comes the directory listing.`<br>`-rwxr-xr-x 1 0 0 29 Jun 08 14:44 Linux Version.txt`<br>`-rwxr-xr-x 1 0 0 825713 Jun 10 18:09 Red_Hat_Enterprise_Linux-6-Release_Notes-en-US.pdf`<br>`-rwxr-xr-x 1 0 0 1378495 Jun 08 14:30 Unified_Attaching_Server-_Master_1583483.pdf`<br>`-rwxr-xr-x 1 0 0 304892095 Jun 08 14:50 elxocm-rhel5-sles10-5.0.17.4-1.tar`<br>`-rwxr-xr-x 1 0 0 2660807 Jun 08 14:50 linux.pdf`<br>`-rwxr-xr-x 1 0 0 31889 Jun 08 14:50 linux_release_notes.pdf`<br>`-rwxr-xr-x 1 0 0 887322 Jun 08 14:50 linux_release_notes_emc.pdf`<br>`-rwxr-xr-x 1 0 0 5753119 Jun 08 14:50 onecommand.pdf`<br>`226 Directory send OK.`<br>`ftp> pwd`<br>`257 "/software/Linux/Emulex_Linux"`<br>`ftp>` |
| 6 | **You will need to switch over to Binary in order to download the software in the proper format!**<br><br>Example:<br><br>`ftp> bin`<br>`200 Switching to Binary mode.`<br>`ftp> get elxocm-rhel5-sles10-5.0.17.4-1.tar`<br>`local: elxocm-rhel5-sles10-5.0.17.4-1.tar remote: elxocm-rhel5-sles10-5.0.17.4-1.tar`<br>`227 Entering Passive Mode (10,127,57,163,143,20)`<br>`150 Opening BINARY mode data connection for elxocm-rhel5-sles10-5.0.17.4-1.tar (304892095 bytes).` |
| 7 | **Quit the FTP session and verify the file downloaded properly to your Emulex_apps directory.**<br><br>`[root@Linux-6 Emulex_apps]# ls`<br>`elxocm-rhel5-sles10-5.0.17.4-1.tar`<br>`[root@Linux-6 Emulex_apps]#` |



EMC² where information lives®

| | |
|---|---|
| 8 | **Extract the source files.**<br><br>• Type **tar xvf ElxLinuxApps-2.1a8-8.0.x.y.tar**<br>• This extraction will install the files into a new directory.<br>• Read the messages and note the directory name<br><br>Example:<br><br>**tar xvf elxocm-rhel5-sles10-5.0.17.4-1.tar**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/i386/**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/i386/jre/**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/i386/jre/elxocmjvm-5.0.17.4-1.i386.rpm**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/i386/rhel-5/**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/i386/rhel-5/elxocmlibhbaapi-5.0.17.4-1.i386.rpm**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/i386/rhel-5/elxocmcore-5.0.17.4-1.i386.rpm**<br><br>**...**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/x86_64/rhel-5/elxocmjvm-5.0.17.4-1.x86_64.rpm**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/x86_64/sles-10/**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/x86_64/sles-10/elxocmlibhbaapi-32bit-5.0.17.4-1.x86_64.rpm**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/x86_64/sles-10/elxocmlibhbaapi-5.0.17.4-1.x86_64.rpm**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/x86_64/sles-10/elxocmcore-5.0.17.4-1.x86_64.rpm**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/x86_64/sles-10/elxocmgui-5.0.17.4-1.x86_64.rpm**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/x86_64/sles-10/elxocmjvm-5.0.17.4-1.x86_64.rpm**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/install.sh**<br><br>**elxocm-rhel5-sles10-5.0.17.4-1/uninstall.sh** |



EMC² where information lives®

| | |
|---|---|
| 9 | **Change to the new directory**<br><br>• Change to the new directory noted above.<br>• Run the installer script by typing **`./install.sh`**<br><br>Example:<br><br>**`[root@SAN-6 /]# cd elxocm-rhel5-sles10-5.0.17.4-1`**<br><br>**`[root@SAN-6 elxocm-rhel5-sles10-5.0.17.4-1]# ls -l`**<br><br>**`total 298056`**<br><br>**`drwxr-xr-x 6 root root 4096 Dec 15 2009 elxocm-rhel5-sles10-5.0.17.4-1`**<br><br>**`-rw-r--r-- 1 root root 304892095 Jun 8 11:58 elxocm-rhel5-sles10-5.0.17.4-1.tar`**<br><br>**`[root@SAN-6 elxocm-rhel5-sles10-5.0.17.4-1]# ./install.sh`** |
| 10 | **The installer package begins the installation process.**<br><br>Example:<br><br>**`[root@SAN-6 elxocm-rhel5-sles10-5.0.17.4-1]# ./install.sh`**<br><br>**`Beginning OneCommand Manager Enterprise Kit Installation...`**<br><br>**`Installing ./i386/rhel-5/elxocmlibhbaapi-5.0.17.4-1.i386.rpm`**<br><br>**`Installing ./i386/rhel-5/elxocmcore-5.0.17.4-1.i386.rpm`**<br><br>**`Installing ./i386/rhel-5/elxocmjvm-5.0.17.4-1.i386.rpm`**<br><br>**`Installing ./i386/rhel-5/elxocmgui-5.0.17.4-1.i386.rpm`**<br><br>**`Starting fcauthd: FC Authentication Daemon: 1.22`**<br><br>**`[ OK ]`**<br><br>**`Starting OneCommand Manager Management Daemon: [ OK ]`**<br><br>**`...`** |



EMC² where information lives®

| | |
|---|---|
| 11 | **When prompted to select desired mode of operation for HBAnyware, select "3".**<br>Example:<br>**Select desired mode of operation for HBAnyware**<br><br>**1 Local Mode : HBA's on this Platform can be managed by HBAnyware clients on this Platform Only.**<br>**2 Managed Mode: HBA's on this Platform can be managed by local or remote HBAnyware clients.**<br>**3 Remote Mode : Same as '2' plus HBAnyware clients on this Platform can manage local and remote HBA's.**<br><br>**Enter the number '1' or '2' or '3' 1**<br>**You selected: 'Remote Mode'** |
| 12 | **When prompted to select, chose to Enable the configuration features for OneCommand Manager.**<br>**Would you like to enable configuration features for OneCommand Manager clients on this platform?**<br><br>**Enter y to allow configuration. (default)**<br>**Enter n for read-only mode.**<br><br>**Enter the letter 'y' or 'n' y**<br>**You selected: Yes, enable configuration** |
| 13 | **Setting the change management mode**<br>• When prompted to allow user to change management mode choose Y<br>Example:<br>**Do you want to allow user to change management mode using set_operating_mode script located in /usr/sbin/hbanyware ?**<br><br>**Enter the letter 'y' if yes, or 'n' if no y**<br>**You selected: Yes** |

| | |
|---|---|
| 14 | **The HBAnyware installation will be complete at this point.**<br><br>**OneCommand Manager Enterprise Kit install completed successfully.** |
| NOTE | • The Emulex LPFC driver is part of the Linux Kernel and **WILL NOT** have to be reloaded.<br><br>• OPTIONAL: Since you have a GUI interface to your Linux server, you will also be able to run the OneCommand Manager GUI client.<br>**`cd /usr/sbin/hbanyware/ocmanager`** |



EMC² where information lives®

| | |
|---|---|
| 15 | **Run the HBAnyware CLI client to view a list of all installed HBAs**<br><br>• To run the HBAnyware CLI client you use the **./hbacmd** command<br>• Type in ./hbacmd listhbas to view all of the Emulex HBAs installed in a server.<br><br>Example:<br><br>**Manageable HBA List**<br><br>**[root@SAN-6 hbanyware]# ./hbacmd listhbas**<br><br>**Manageable HBA List**<br><br>**Port WWN : 10:00:00:00:c9:6a:a2:62**<br><br>**Node WWN : 20:00:00:00:c9:6a:a2:62**<br><br>**Fabric Name : 10:00:00:05:1e:34:19:ad**<br><br>**Flags : 8000fa00**<br><br>**Host Name : SAN-6**<br><br>**Mfg : Emulex Corporation**<br><br>**Serial No. : VM73172221**<br><br>**Port Number : n/a**<br><br>**Mode : Initiator**<br><br>**PCI Function: 0**<br><br>**Port Type : FC**<br><br>**Model : LP10000**<br><br>**Port WWN : 10:00:00:00:c9:6a:a2:63**<br><br>**Node WWN : 20:00:00:00:c9:6a:a2:63**<br><br>**Fabric Name : 10:00:00:05:1e:34:3e:7d**<br><br>**Flags : 8000fa00**<br><br>**Host Name : SAN-6**<br><br>**Mfg : Emulex Corporation**<br><br>**Serial No. : VM73172221**<br><br>**Port Number : n/a**<br><br>**…** |



EMC² where information lives®

| | |
|---|---|
| 16 | **List firmware versions, serial numbers, WWN**<br><br>• To list firmware versions, serial numbers, WWN and a variety of model specific information, type in: ./hbacmd hbaattrib <wwpn><br>• Take some time to look through the different types of information listed here.<br><br>Example:<br><br>**[root@SAN-6 hbanyware]# ./hbacmd hbaattrib 10:00:00:00:c9:6a:a2:62**<br><br>**HBA Attributes for 10:00:00:00:c9:6a:a2:62**<br><br>**Host Name : SAN-6**<br><br>**Manufacturer : Emulex Corporation**<br><br>**Serial Number : VM73172221**<br><br>**Model : LP10000**<br><br>**Model Desc : Emulex LP10000 2Gb PCI-X Fibre Channel Adapter**<br><br>**Node WWN : 20 00 00 00 c9 6a a2 62**<br><br>**Node Symname : Emulex LP10000 FV1.91A1 DV8.2.0.63.3p**<br><br>**HW Version : 1001206d**<br><br>**Opt ROM Version: 5.01a5**<br><br>**FW Version : 1.91A1 (T2D1.91A1), sli-2**<br><br>**Vendor Spec ID : 10DF**<br><br>**Number of Ports: 1**<br><br>**Driver Name : lpfc**<br><br>**Device ID : FA00**<br><br>**HBA Type : LP10000**<br><br>**Operational FW : SLI-2 Overlay**<br><br>**SLI1 FW : 1.91a1**<br><br>**SLI2 FW : 1.91a1**<br><br>**IEEE Address : 00 00 c9 6a a2 62**<br><br>**Boot Code : Enabled**<br><br>**Boot Version : 5.01a5**<br><br>**...** |



EMC² where information lives®

| | |
|---|---|
| 17 | **View host port information, fabric parameters and # of ports zoned**<br><br>• To view host port information (e.g., port speed, device paths) and fabric parameters (e.g., fabric ID (S_ID), # of ports zoned along with this port), type in: ./hbacmd portattrib <wwpn><br>• Take some time to look through the different types of information listed here.<br><br>Example:<br><br>**[root@SAN-6 hbanyware]# ./hbacmd portattrib 10:00:00:00:c9:6a:a2:62**<br><br>**Port Attributes for 10:00:00:00:c9:6a:a2:62**<br><br>**Node WWN : 20 00 00 00 c9 6a a2 62**<br><br>**Port WWN : 10 00 00 00 c9 6a a2 62**<br><br>**Port Symname : Emulex PPN-10:00:00:00:c9:6a:a2:62**<br><br>**Port FCID : 10C00**<br><br>**Port Type : Fabric**<br><br>**Port State : Operational**<br><br>**Port Service Type : 8**<br><br>**Port Supported FC4 : 00 00 01 00 00 00 00 01**<br>**00 00 00 00 00 00 00 00**<br>**00 00 00 00 00 00 00 00**<br>**00 00 00 00 00 00 00 00**<br><br>**Port Active FC4 : 00 00 01 00 00 00 00 01**<br>**00 00 00 00 00 00 00 00**<br>**00 00 00 00 00 00 00 00**<br>**00 00 00 00 00 00 00 00**<br><br>**Port Supported Speed: 1 2 GBit/sec**<br><br>**Port Speed : 2 GBit/sec**<br><br>**Max Frame Size : 2048**<br><br>**OS Device Name : /sys/class/scsi_host/host1**<br><br>**Num Discovered Ports: 4**<br><br>**Fabric Name : 10 00 00 05 1e 34 19 ad**<br><br>**Function Type : FC** |



EMC² where information lives®

| | |
|---|---|
| 18 | **View HBA attributes for the server**<br><br>• In order to view HBA attributes for the server, type in: ./hbacmd serverattrib <wwpn><br>• Take some time to look through the different types of information listed here.<br><br>Example:<br><br>**[root@SAN-6 hbanyware]# ./hbacmd serverattrib 10:00:00:00:c9:6a:a2:62**<br><br>**Server Attributes for 10:00:00:00:c9:6a:a2:62**<br><br>**Host Name : SAN-6**<br><br>**FW Resource Path : /usr/sbin/hbanyware/RMRepository/**<br><br>**DR Resource Path : /usr/sbin/hbanyware/RMRepository/**<br><br>**OneCommand Mgr. Server Ver. : 33.0.17.4**<br><br>**Host OS Version : Linux2.6.18-194.el5PAE i686** |
| 19 | **View HBA attributes for the driver parameters**<br><br>• In order to view HBA attributes for the driver parameters, type in ./hbacmd getdriverparams <wwpn><br>• Current values are shown under the Cur heading within the box<br><br>Example:<br><br>**[root@SAN-6 hbanyware]# ./hbacmd getdriverparams 10:00:00:00:c9:6a:a2:62**<br><br>**Driver Params for 10:00:00:00:c9:6a:a2:62. Values in HEX format.**<br><br>**DX string Low High Def Cur Exp Dyn**<br><br>**00: log-verbose 0 ffff 0 0 800d 1**<br><br>**01: lun-queue-depth 1 80 1e 1e 800d 2**<br><br>**02: scan-down 0 1 1 1 800d 2**<br><br>**03: nodev-tmo 0 ff 1e 1e 800d 1**<br><br>**04: topology 0 6 0 0 800d 2**<br><br>**05: link-speed 0 8 0 0 800d 2**<br><br>**06: fcp-class 2 3 3 3 800d 2**<br><br>**07: use-adisc 0 1 0 0 800d 1**<br><br>**08: ack0 0 1 0 0 800d 2**<br><br>**09: cr-delay 0 3f 0 0 800d 2**<br><br>**...** |



EMC² where information lives®

20 **Verify the Link Speed for the previous output is set for Auto Select.**

- Verify the Link Speed is set for Auto Select. The following is from The HBAnyware Utility User Manual:

| | | | | | |
|---|---|---|---|---|---|
| link-speed | Controller Specific | 0 | 0=auto select<br>1=1G<br>2=2G<br>4=4G | No | Sets link speed. |

- Verify the Topology is set for a value of 0x00.

| | | | | | |
|---|---|---|---|---|---|
| topology | Controller Specific | 0x0 | 0x0=loop , then P2P<br>0x2=P2P only<br>0x4=loop only<br>0x6=P2P, then loop | No | This variable controls the Fibre Channel topology expected by lpfc at boot time. Fibre Channel offers point-to-point, fabric, and arbitrated loop topologies.To make the adapter operate as an N_Port, select point-to-point mode (used for N_Port to F_Port, and N_Port to N_Port connections). To make the adapter operate in a Fibre Channel loop as an NL_Port, select loop mode (used for private loop and public loop topologies). The driver will reject an attempt to set the topology to a value not in the above list. The auto-topology settings 0 and 6 will not work unless the adapter is using firmware version 3.20 or higher. |

- Note: You should always use EMC-specific drivers. They are installed with settings configured according to EMC best practices.

*End of Lab Exercise 5 Part 1*



EMC² where information lives®

| Step | Action |
|---|---|
| Note | ***Before*** **you install PowerPath in working environments note that installing or upgrading PowerPath requires you to reboot the host.**<br><br>**Plan to install or upgrade PowerPath when a reboot will cause minimal site disruption.**<br><br>**In this lab, you install PowerPath 5.5 for Linux** |
| 1 | ***Before you install PowerPath ensure that:***<br><br>• **No devices are currently managed by Linux MPIO**<br>• **Run a dmsetup ls**<br>• **Run a chkconfig --list \|grep multipathd**<br><br>**Example:**<br><br>`[root@SAN-6 ~]# dmsetup ls`<br><br>`No devices found`<br><br>`[root@SAN-6 ~]# chkconfig --list |grep multipathd`<br><br>`multipathd 0:off 1:off 2:off 3:off 4:off 5:off 6:off`<br><br>`The multipath daemon does not startup upon boot`<br><br>• **All devices are blacklisted in the /etc/multipath.conf file**<br>• **On all systems in your lab this has already been done for you**<br>• **To check this run more /etc/multipath.conf**<br><br>Example:<br><br>`[root@SAN-6 ~]# more /etc/multipath.conf`<br><br>`# This is a basic configuration file with some examples, for device mapper`<br><br>`# multipath.`<br><br>`# For a complete list of the default configuration values, see`<br><br>`...`<br><br>`# Blacklist all devices by default. Remove this to enable multipathing`<br><br>`# on the default devices.`<br><br>`blacklist {`<br><br>`devnode "*"`<br><br>`}...` |



EMC² where information lives®

| Step | Action |
|---|---|
| 2 | **Change directory to the SAN_Machine_apps**<br><br>• Change directory to the **SAN_Machine_apps** directory<br><br>Example:<br><br>**`cd SAN_Machine_apps`** |
| 3 | **Within the SAN_Machine_apps directory create a Powerpath_app folder to copy the PowerPath software to.**<br><br>`[root@Linux-6 SAN_Machine_apps]# mkdir Powerpath_app`<br>`[root@Linux-6 SAN_Machine_apps]# cd Powerpath_app`<br>`[root@Linux-6 Powerpath_app]#` |
| 4 | **cd to the Powerpath_app directory and copy the PowerPath software to it from the FTP Server.**<br><br>• Once you have established the ftp connection then change directory to software/Linux/<br>• Example file name is `EMCPower.LINUX.5.5.GA.b275.tar.gz`<br>• Don't forget to change to binary "**bin**" before the transfer<br>• Use the get command to transfer the file to your local Powerpath_app directory<br>• Once completed quit FTP and verify file downloaded to the Powerpath_app directory<br><br>Example:<br><br>root@Linux-6:~/SAN_Machine_apps/Powerpath_app<br>File Edit View Terminal Tabs Help<br>331 Please specify the password.<br>Password:<br>230 Login successful.<br>Remote system type is UNIX.<br>Using binary mode to transfer files.<br>ftp> cd software<br>250 Directory successfully changed.<br>ftp> cd Linux<br>250 Directory successfully changed.<br>ftp> ls<br>227 Entering Passive Mode (10,127,57,163,226,80)<br>150 Here comes the directory listing.<br>-rw-r--r-- 1 0 0 118306414 Mar 30 16:51 EMCPower.LINUX.5.5.GA.b275.tar.gz<br>drwxr-xr-x 2 0 0 4096 Jun 28 14:42 Emulex_Linux<br>-rw-r--r-- 1 0 0 2744840 Mar 28 12:25 HostAgent-Linux-32-x86-en_US-1.1.0.1.<br>m<br>-rw-r--r-- 1 0 0 5994799 Mar 28 12:25 NaviCLI-Linux-32-x86-en_US-7.31.0.3.6<br>-rw-r--r-- 1 0 0 6385927 Mar 28 12:25 ServerUtil-Linux-32-x86-en_US-1.1.0.1<br>pm<br>-rw-r--r-- 1 0 0 2860841 Mar 30 17:06 scli-1.7.1-18.i386.rpm.gz<br>226 Directory send OK.<br>ftp> bin<br>200 Switching to Binary mode.<br>ftp> get EMCPower.LINUX.5.5.GA.b275.tar.gz |



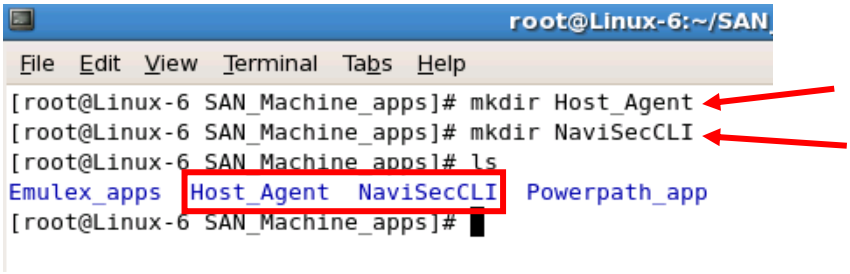
EMC² where information lives®

| | |
|---|---|
| 5 | **If needed, then untar the PowerPath archive.**<br><br>• Type: tar -xzf EMCPower.LINUX.5.5.GA.b275.tar.gz<br>• Else go to the next step. |
| 6 | **Install PowerPath for Linux**<br><br>• To install PowerPath<br>Type: rpm -i EMCPower.LINUX-5.5.0.00.00-275.RHEL5.i386.rpm<br><br>**You will get back a legacy message like this:**<br><br>**All trademarks used herein are the property of their respective owners.**<br><br>**NOTE: License registration is not required to manage the CLARiiON AX series array.**<br><br>**Move on to the next step.** |
| 7 | **Register PowerPath on the host.**<br><br>• Type: emcpreg –install<br>• Enter y at the prompt.<br><br>When prompted, enter the 24-character alphanumeric sequence supplied here and press ENTER. Be sure to use hyphens to separate groups of four alphanumeric characters without any spaces. In the Lab you will use License Key: **B4P9-DB4Q-LF6W-Q0SA-ML90-VRL4**<br>*(those are zeros, not Os !!)*<br><br>Important: The license key should not be given out to anyone.<br><br>If you enter a valid registration key, you see a Key successfully installed message.<br><br>**Example**<br><br>**emcpreg -install**<br><br>**========== EMC PowerPath Registration ==========**<br><br>**Do you have a new registration key or keys to enter?[n] y**<br><br>**Enter the registration keys(s) for your product(s),**<br><br>**one per line, pressing Enter after each key.**<br><br>**After typing all keys, press Enter again.**<br><br>**Key (Enter if done): B4P9-DB4Q-LF6W-Q0SA-ML90-VRL4**<br><br>**1 key(s) successfully added.**<br><br>**Key successfully installed.** |

| | |
|---|---|
| 7 | **Start PowerPath.**<br>• Type: /etc/init.d/PowerPath start<br>**Example**<br>`[root@RH-Production8 PowerPath]# /etc/init.d/PowerPath start`<br>`Starting PowerPath:  done` |
| 8 | **Reboot the Linux server to finalize the Linux Powerpath installation**<br>• At the prompt type  shutdown -r -t 1 now<br>**Example:**<br>`[root@RH-Production8 PowerPath]# shutdown -r -t 1 now`<br>`Broadcast message from root (pts/1) (Wen Jun 8 18:39:05 2011):`<br>`The system is going down for reboot NOW!` |

*End of Lab Exercise 5 Part 2*

# Lab 5: Part 3 - Install the Unisphere Agent & Navisphere Secure CLI software on your Linux host

| Step | Action |
|---|---|
| Note | **In order to run the Host Agent or Navisphere Secure CLI, your Linux host must have the HBA hardware and driver installed properly. Please make sure it is before proceeding. If you need to then contact your instructor for assistance.**<br><br>***You should be familiar with the FTP process at this point. In order to be more concise we will be more specific with our directions going forward in this lab.*** |
| 1 | **Change directory to the SAN_Machine_apps**<br><br>• Change directory to the **SAN_Machine_apps** directory<br><br>Example:<br><br>`cd SAN_Machine_apps` |
| 2 | **Create two folders in the SAN_Machine_apps directory for your agent and your Secure CLI software.**<br><br>• Within the SAN_Machine_apps directory create a Host_Agent directory to copy the Unisphere Host Agent software to.<br>• Within the SAN_Machine_apps directory create a NaviSecCLI directory to copy the Navisphere Secure CLI software to.<br><br>  |



EMC² where information lives®

| | |
|---|---|
| 3 | **cd to the Host_Agent directory and copy the Unisphere Host Agent software to it from the FTP Server.**<br><br>• Establish an ftp connection with the Course Software Share then change directory to software/Linux/<br>• Example file name is: `HostAgent-Linux-32-x86-en_US-1.1.0.1.0366-1.i386.rpm`<br>• Don't forget to change to binary "**bin**" before the transfer<br>• Use the get command to transfer the file to your local Host_Agent directory<br>• Once completed quit FTP and verify file downloaded to the Host_Agent directory<br><br>`ftp> cd software/Linux`<br>`250 Directory successfully changed.`<br>`ftp> ls`<br>`227 Entering Passive Mode (10,127,57,163,100,146)`<br>`150 Here comes the directory listing.`<br>`-rw-r--r--  1 0  0  118306414 Mar 30 16:51 EMCPower.LINUX.5.5.GA.b275.tar.gz`<br>`drwxr-xr-x  2 0  0  4096 Jun 28 14:42 Emulex_Linux`<br>`-rw-r--r--  1 0  0  2744840 Mar 28 12:25 HostAgent-Linux-32-x86-en_US-1.1.0.1.0366-1.i386.rpm`<br>`-rw-r--r--  1 0  0  5994799 Mar 28 12:25 NaviCLI-Linux-32-x86-en_US-7.31.0.3.66-1.i386.rpm`<br>`-rw-r--r--  1 0  0  6385927 Mar 28 12:25 ServerUtil-Linux-32-x86-en_US-1.1.0.1.0366-1.i386.rpm`<br>`-rw-r--r--  1 0  0  2860841 Mar 30 17:06 scli-1.7.1-18.i386.rpm.gz`<br>`226 Directory send OK.`<br>`ftp> bin`<br>`200 Switching to Binary mode.`<br>`ftp> get HostAgent-Linux-32-x86-en_US-1.1.0.1.0366-1.i386.rpm` |
| 4 | **cd to the NaviSecCLI directory and copy the Navisphere Secure CLI software to it from the FTP Server.**<br><br>• Establish another ftp connection with the Course Software Share then change directory to software/Linux/<br>• Example file name is: `NaviCLI-Linux-32-x86-en_US-7.31.0.3.66-1.i386.rpm`<br>• Don't forget to change to binary "**bin**" before the transfer<br>• Use the get command to transfer the file to your local NaviSecCLI directory<br>• Once completed quit FTP and verify file downloaded to the NaviSecCLI directory<br><br>`ftp> cd software/Linux`<br>`250 Directory successfully changed.`<br>`ftp> ls`<br>`227 Entering Passive Mode (10,127,57,163,225,110)`<br>`150 Here comes the directory listing.`<br>`-rw-r--r--  1 0  0  118306414 Mar 30 16:51 EMCPower.LINUX.5.5.GA.b275.tar.gz`<br>`drwxr-xr-x  2 0  0  4096 Jun 28 14:42 Emulex_Linux`<br>`-rw-r--r--  1 0  0  2744840 Mar 28 12:25 HostAgent-Linux-32-x86-en_US-1.1.0.1.0366-1.i386.rpm`<br>`-rw-r--r--  1 0  0  5994799 Mar 28 12:25 NaviCLI-Linux-32-x86-en_US-7.31.0.3.66-1.i386.rpm`<br>`-rw-r--r--  1 0  0  6385927 Mar 28 12:25 ServerUtil-Linux-32-x86-en_US-1.1.0.1.0366-1.i386.rpm`<br>`-rw-r--r--  1 0  0  2860841 Mar 30 17:06 scli-1.7.1-18.i386.rpm.gz`<br>`226 Directory send OK.`<br>`ftp> bin`<br>`200 Switching to Binary mode.`<br>`ftp> get NaviCLI-Linux-32-x86-en_US-7.31.0.3.66-1.i386.rpm` |

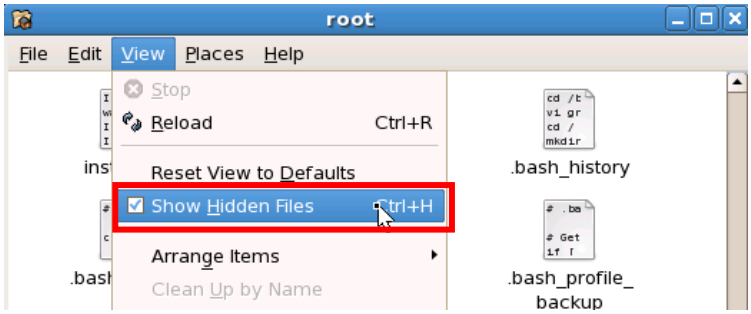
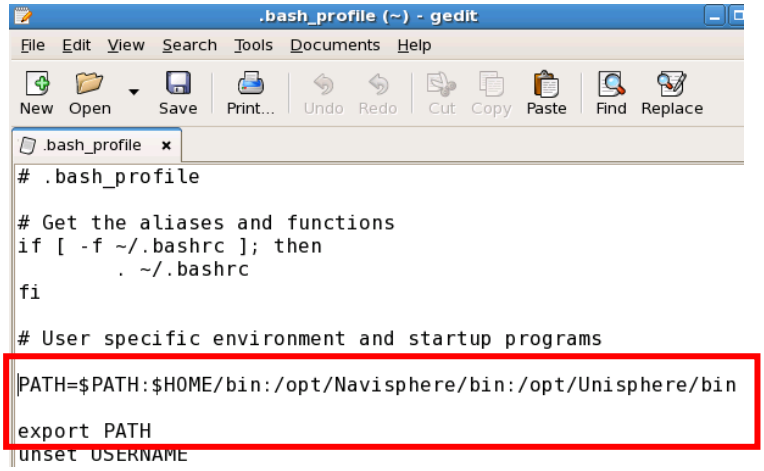


EMC² where information lives®

| | |
|---|---|
| 5 | **Install the Host Agent and CLI software:**<br><br>• **Install both the agent and CLI using the rpm command as shown below**<br>• **Please set the security setting to LOW on the Navisphere Secure CLI**<br>• **Then verify that the Host Agent and Navisphere Secure CLI are installed and running**<br><br>**Examples:**<br><br>`cd Host_Agent`<br>`rpm -ivh HostAgent-Linux-32-x86-en_US-1.1.0.1.0366-1.i386.rpm`<br>`Preparing...  ########################################### [100%]`<br>`1:HostAgent-Linux-32-x86-############################### [100%]`<br><br>`rpm -ivh NaviCLI-Linux-32-x86-en_US-7.31.0.3.66-1.i386.rpm`<br>`Preparing...  ########################################### [100%]`<br>`1:NaviCLI-Linux-32-x86-en############################### [100%]`<br>`Please enter the verifying level(low\|medium\|l\|m) to set?`<br>`l`<br>`Setting low verifying level`<br><br>`rpm -qa \|more \|grep NaviCLI`<br>`NaviCLI-Linux-32-x86-en_US-7.31.0.3.66-1`<br><br>`rpm -qa \|more \|grep HostAgent`<br>`HostAgent-Linux-32-x86-en_US-1.1.0.1.0366-1` |



EMC² where information lives®

| | |
|---|---|
| 6 | **Edit the $HOME/.bash_profile to add Navisphere Secure CLI and the Unisphere agent to the path statement.**<br><br>• It is **HIGHLY** suggested that you make backups of these files **BEFORE** you change them.<br><br>**Example:**<br><br>`ls -al \|grep .bash`<br>`-rw-------  1 root root  8474 Jun  9 11:58 .bash_history`<br>`-rw-r--r--  1 root root    24 Jul 12  2006 .bash_logout`<br>`-rw-r--r--  1 root root   191 Jul 12  2006 .bash_profile`<br>`-rw-r--r--  1 root root   176 Jul 12  2006 .bashrc`<br>`cp .bash_profile .bash_profile_backup`<br>`cp .bashrc .bashrc_backup` |
| 7 | **Use a text editor to edit the $HOME/.bash_profile to add Navisphere Secure CLI and the Unisphere agent to the path statement.**<br><br>• You can use the GUI text editor to modify these quicker if you are not familiar with the vi tool<br>• You will have to "show hidden files" if you use the GUI text editor<br>• The modified entry should add the entries for /opt/Navisphere/bin and /opt/Unisphere/bin<br><br>**Examples:**<br><br>  <br><br>  <br> |



EMC² where information lives®

| | |
|---|---|
| 8 | **Once this is done run the following to make sure the new .bash_profile is loaded by forcing the file to be read in.**<br><br>**Example: (*Output for example only has been modified to read easier*)**<br><br>`. .bash_profile`<br><br>`echo $PATH`<br><br>`:/usr/kerberos/sbin:/usr/kerberos/bin:/usr/local/sbin`<br>`:/usr/local/bin:/sbin:/bin:/usr/sbin:/usr/bin:/root/bin`<br>`:/root/bin`<br>`:/opt/Navisphere/bin`<br>`:/opt/Unisphere/bin` |
| 9 | **Verify Privileged Users in the agent.config file.**<br><br>• Verify Privileged Users in the agent.config file.<br>• The entry for the root user should be automatically created so you should just need to verify this<br>• Change to the /etc/Unisphere directory and using the ls command look for the file: agent.config file.<br>• Open the file with the more command and search for user.<br>• To search the file type / followed by user.<br>• Notice the line that starts with **user root**.<br>• That is the administrative Privileged User.<br><br>**Example:**<br><br>`[root@SAN-6 Unisphere]# more agent.config`<br><br>`...`<br><br>`/root`<br><br>`...`<br><br>`user root  # only on this machine`<br><br>`#user sblue@picasso  # individual user "sblue" on host "picasso"`<br><br>`#user lgreen@hannibal  # individual user "lgreen" on host "hannibal"`<br><br>`...` |



EMC² where information lives®

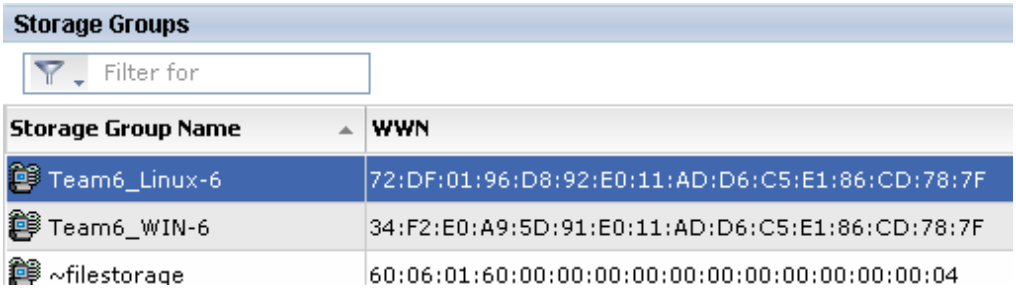
| | |
|---|---|
| 10 | **Restart the Host Agent**<br><br>• Enter the following commands from the root directory to stop and restart the agent:<br>• /etc/init.d/hostagent stop (only one space; between agent and stop.)<br>• /etc/init.d/hostagent start<br>• /etc/init.d/hostagent status<br><br>**Example:**<br><br>**`/etc/init.d/hostagent stop`**<br>**`Shutting down hostagent:  [  OK  ]`**<br>**`/etc/init.d/hostagent start`**<br>**`Starting Navisphere agent:  [  OK  ]`**<br>**`/etc/init.d/hostagent status`**<br>**`hostagent (pid 7286) is running...`** |

*End of Lab Exercise 5 Part 3*



EMC² where information lives®

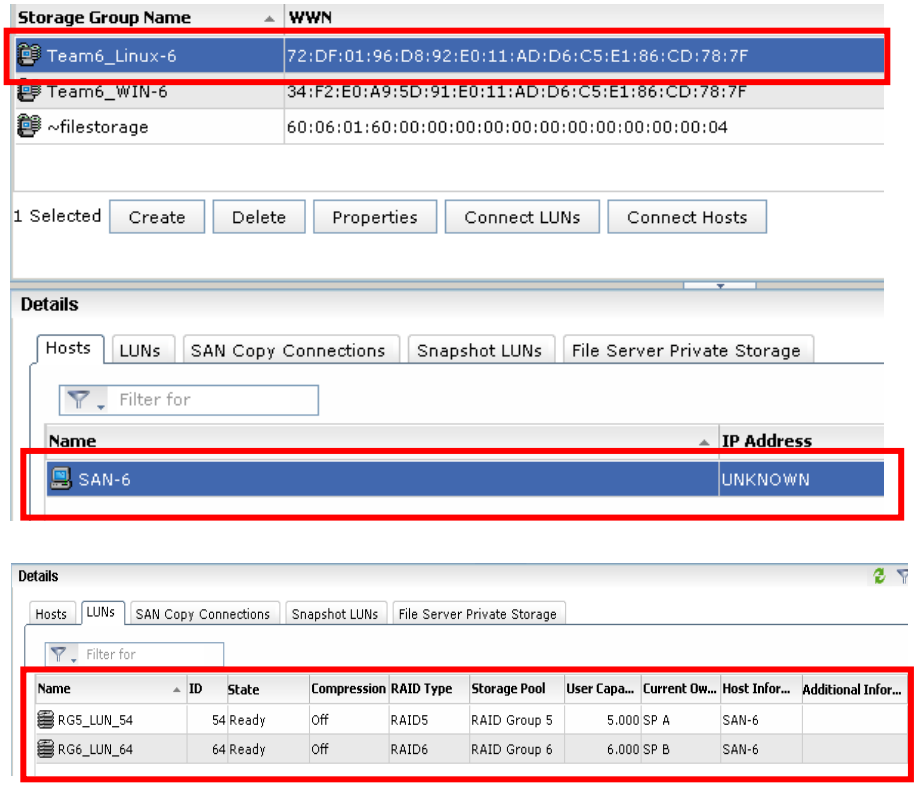
# Lab 5: Part 4 - Create and Populate Storage Groups with EMC Unisphere – Linux

| Step | Action |
|---|---|
| 1 | **System Login:**<br>• Login to Unisphere from your **Physical Linux host** (**SAN-X** where **X** is your team number) machine with your **sysadmin** account credential.<br>• From the Dashboard view, select your **VNX** from the All System dropdown lists and click **System** on the Navigation Bar. |
| 2<br>**Optional Step** | **Verify Storage Groups are Enabled:**<br>• We have already verified that Storage Groups were enabled in the last lab so it is not necessary for this lab. However feel free to practice the steps if you wish, else move to the next step.<br>• From the **System Management** menu on the right of the screen, click **System Properties**. This launches the **Storage Systems Properties** window.<br>• Click the **General** tab. Under the **Configurations** options, locate the checkbox next to Storage Groups box. This option **enables** storage group capability for the selected storage system. This option cannot be disabled, so the check box appears dimmed and is unavailable when Storage Groups is enabled. |
| 3 | **Create a Storage Group:**<br>• Click **Hosts > Storage Groups** from the navigation bar.<br>• From the **Storage Groups** window click **Create**.<br>o Note: If there is a storage group already created please ignore it.<br>• Name the **Storage Group: TeamX_Linux-X** where X is your team number. Click **OK.**<br>• A message will ask you "**if you would like to add LUNs and connect host to the storage group"**,<br>Click **No**.<br>  |



EMC² where information lives®

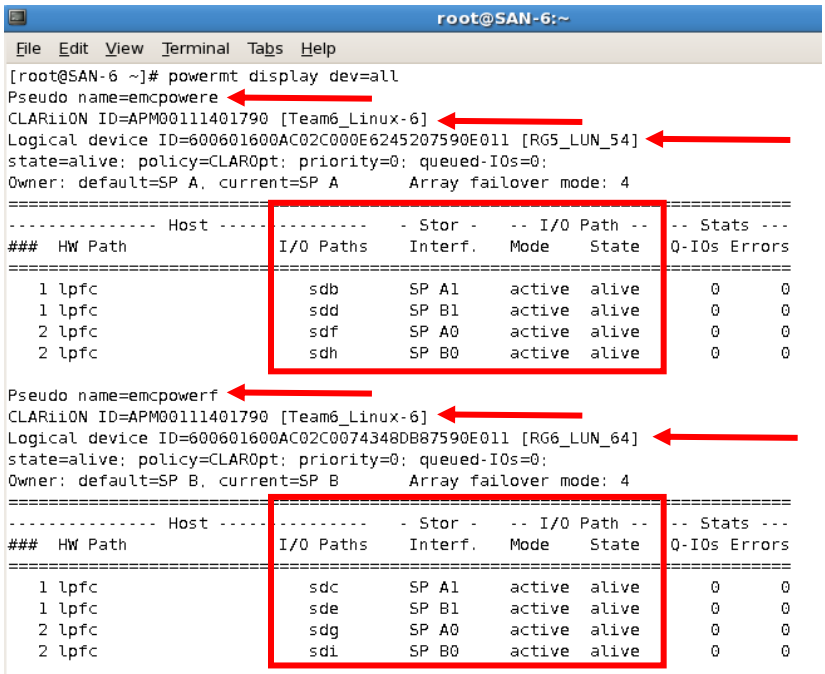
| Step | Action |
|---|---|
| 4 | **Add LUNs to the Storage Group:**<br>• From the Storage Group window select your **TeamX_Linux-X** storage group and click **Properties.**<br>• Click the **LUNs** tab. From the **Available LUNs** window, **expand** the **RG5** and **RG6** containers. Use the scroll bar to see all the available LUNs. Locate the following LUNs **(RG5_LUN_54, RG6_LUN_64)** and **add** them to the **Storage group** by selecting the LUN and clicking the **Add** button.<br>• In the **Selected LUNs** window click the Host ID field and give **RG5_LUN_54** a **Host ID** of **54**<br>• In the Selected LUNs window click the Host ID field and give **RG6_LUN_64** a **Host ID** of **64**.<br>  ○ Note: The Host IDs are used by the Linux server to see the LUNs<br>• Click **OK**, **Yes, OK**. |
| 5 | **Add a Host to the Storage Group:**<br>• From the Storage Group window select your **TeamX_Linux-X** storage group and click **Properties.**<br>• Click the **Hosts** tab. Select your **Physical Linux host** (**SAN-X** where **X** is your team number) from the **Available Hosts** pane and click the → to move the hosts to the **Hosts to be Connected** pane. Click **OK, OK.** |

| Step | Action |
|---|---|
| 6 | **Verify Storage Group Creation:**<br><br>• From the **Host Management** menu on the right side of the screen click **Update All Hosts**.<br>• Select your **storage system** and click **Poll**. Click **Yes**. After the **Status** reads **Success** followed by the current date and time click Cancel.<br>• From the Storage Group window select your **TeamX_Linux-X** storage group**.**<br>• From the **Details** section click the **Hosts** tab and verify that your **SAN-X** host (where X is your team number) is connected<br>• From the **Details** section click the **LUNs** tab and verify that LUNs **RG5_LUN_54, and RG_LUN_ 64** are connected.<br><br>  |
| 7 | **Reboot the Linux Server and log back into the system when it comes back up.**<br><br>• In order to refresh and rescan the logical volume management of the Linux server.<br><br>**Example:**<br><br>`[root@SAN-6 ~]# shutdown -r -t 1 now` |

*End of Lab Exercise 5 Part 4*



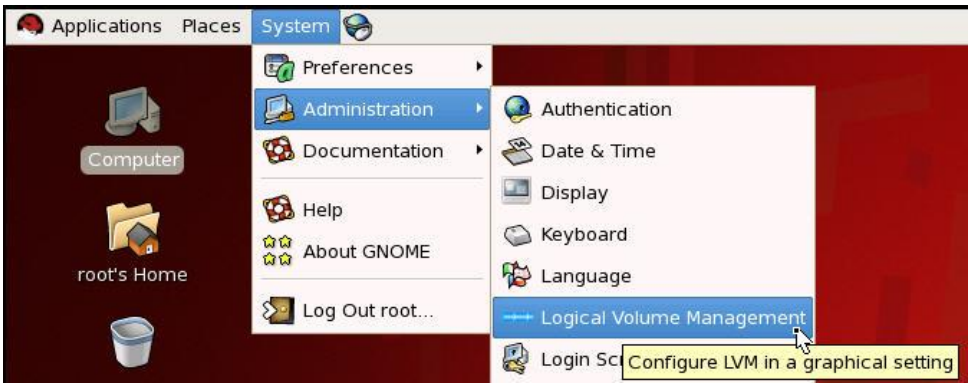
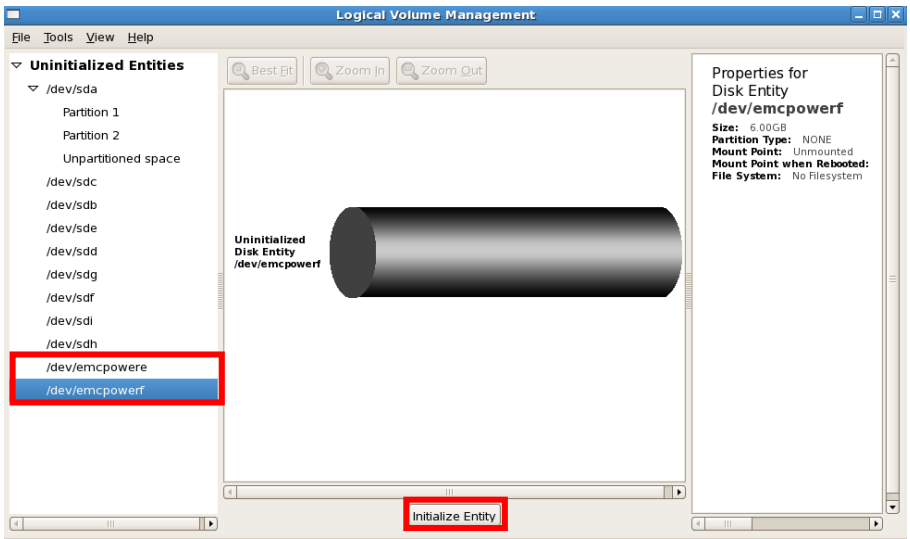
EMC² where information lives®

| Step | Action |
|---|---|
| Note Please Read! | **The portions of these labs for Linux Logical Volume Management were designed and captured using the Linux GUI. If you have the requisite knowledge and feel more comfortable using the Command Line then please do so. You can find an example script in the Appendix section immediately following this lab, Lab 5: Part 5.** |
| 1 | **Run a Powermt display to see the new devices that you have allocated to your host.**<br>• From the **Terminal window run a powermt display dev=all**<br>• What is some of the information that you can use here to identify specifics about each of the volumes?<br>_____<br>Example:<br>  |

root@SAN-6:~
File Edit View Terminal Tabs Help
[root@SAN-6 ~]# powermt display dev=all
Pseudo name=emcpowere
CLARiiON ID=APM00111401790 [Team6_Linux-6]
Logical device ID=600601600AC02C000E6245207590E011 [RG5_LUN_54]
state=alive; policy=CLAROpt; priority=0; queued-IOs=0;
Owner: default=SP A, current=SP A Array failover mode: 4
---------- Host ---------- - Stor - -- I/O Path -- -- Stats ---
### HW Path I/O Paths Interf. Mode State Q-IOs Errors
1 lpfc sdb SP A1 active alive 0 0
1 lpfc sdd SP B1 active alive 0 0
2 lpfc sdf SP A0 active alive 0 0
2 lpfc sdh SP B0 active alive 0 0
Pseudo name=emcpowerf
CLARiiON ID=APM00111401790 [Team6_Linux-6]
Logical device ID=600601600AC02C0074348DB87590E011 [RG6_LUN_64]
state=alive; policy=CLAROpt; priority=0; queued-IOs=0;
Owner: default=SP B, current=SP B Array failover mode: 4
---------- Host ---------- - Stor - -- I/O Path -- -- Stats ---
### HW Path I/O Paths Interf. Mode State Q-IOs Errors
1 lpfc sdc SP A1 active alive 0 0
1 lpfc sde SP B1 active alive 0 0
2 lpfc sdg SP A0 active alive 0 0
2 lpfc sdi SP B0 active alive 0 0

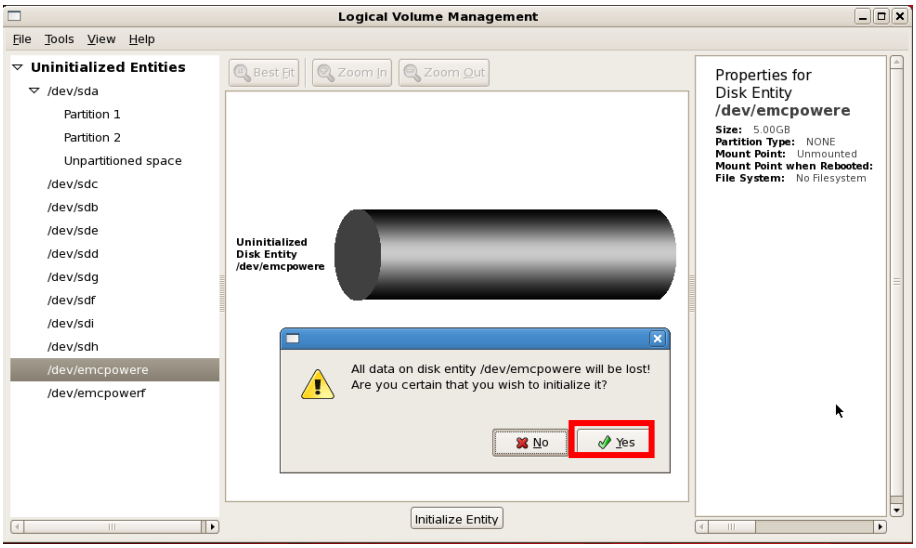
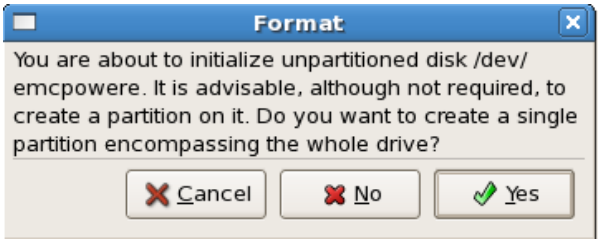


EMC² where information lives®

| Step | Action |
|---|---|
| 2 | **Navigate to the Disk Management menu on your Linux Workstation. This GUI may be a bit SLOW so please be patient!**<br><br>• On your **Linux workstation**, click **System, Administration** and select **Logical Volume Management**.<br><br>  |
| 3 | **Navigate to the Logical Volume Management menu on your Linux Workstation.**<br><br>• From the **LVM** screen, expand the uninitialized entries on the left hand side of the screen<br>• If you **do** see 2 emcpower devices that need to be initialized then proceed (else contact your instructor for assistance)<br>• Click on the Initialize Entry at the bottom of the screen.<br><br>  |

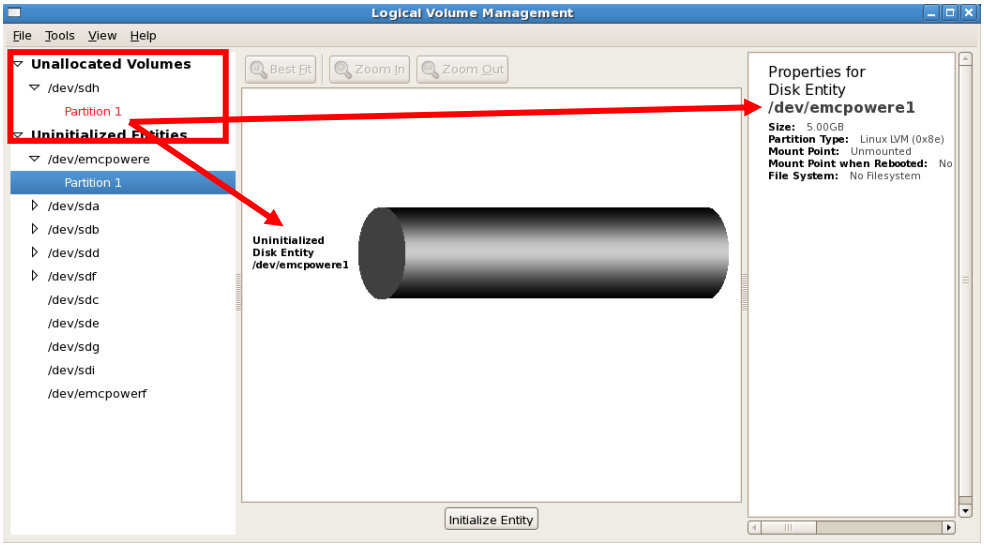


EMC² where information lives®

| Step | Action |
|---|---|
| 4 | Click **Yes** to the warning message that will pop up.<br><br>Example:<br><br>  |
| 5 | Click **Yes** to the Information message that will pop up.<br><br>Example:<br><br>  |

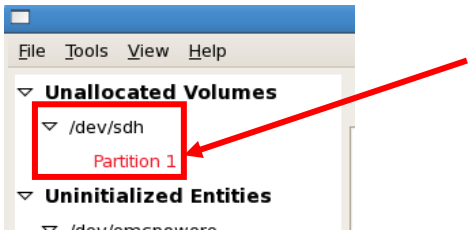
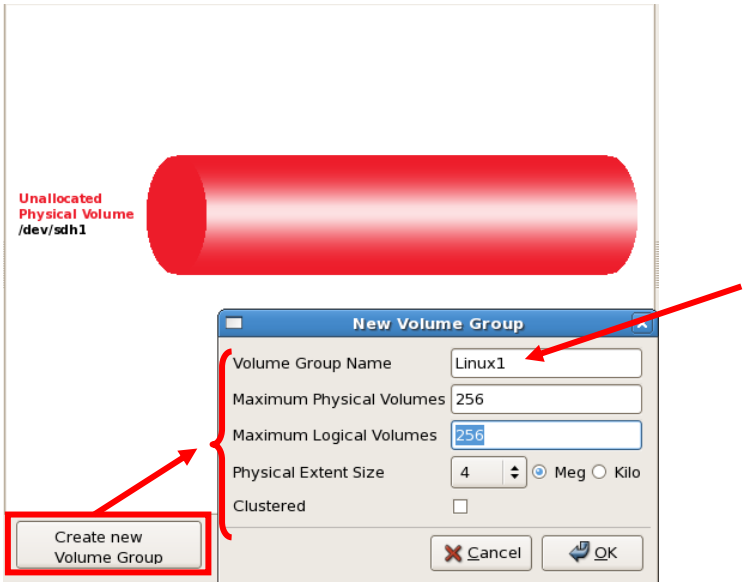


EMC² where information lives®

| Step | Action |
|---|---|
| 6 | Once this is complete you will notice an unallocated colume heading now appearing on the left side on the screen with a new entry of the device that you just initialized and formatted.<br><br>Example:<br>  |

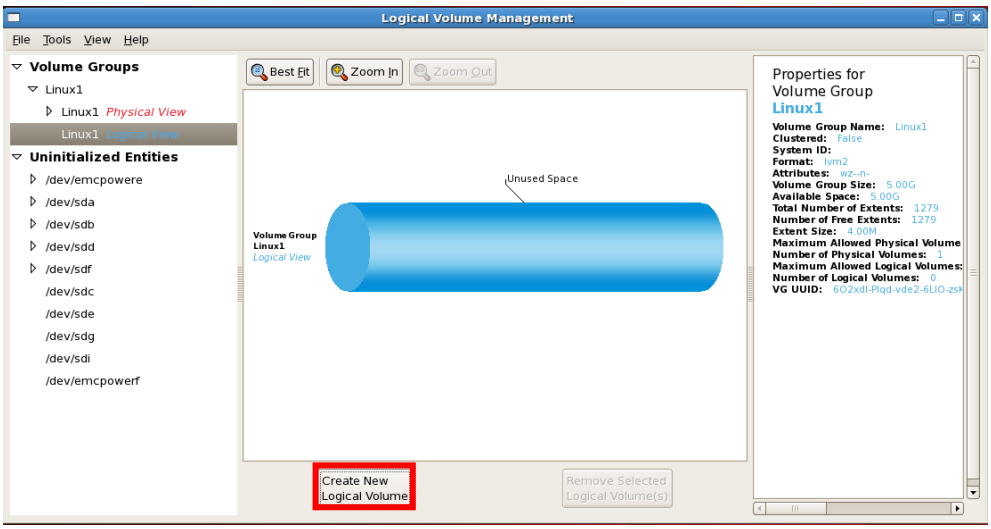


EMC² where information lives®

| Step | Action |
|---|---|
| 7 | Create a new Volume Group for the device<br><br>• Click on the device you wish to create a new volume group for<br>• Next click **New Volume Group** at the bottom of the screen.<br>• Name the Volume Group “Linux1” and take the defaults for the rest of the options.<br><br>  <br><br><br>  <br> |

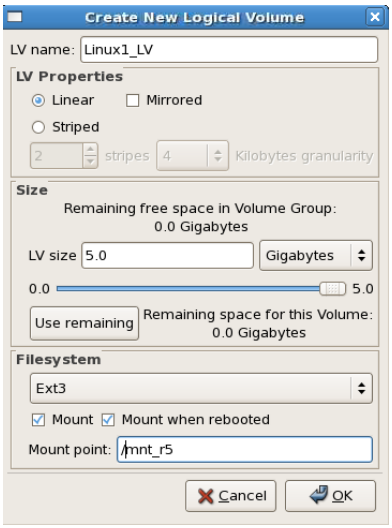
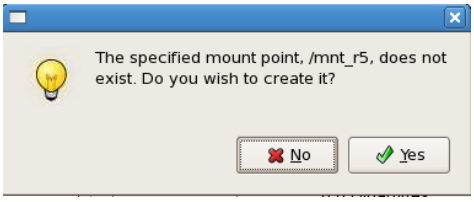


EMC² where information lives®

| Step | Action |
|---|---|
| 8 | Create a new Logical Volume for the device<br><br>• Click on the logical device you wish to create a new logical volume for<br>• Next click **Create New Logical Volume** at the bottom of the screen.<br><br>Example:<br><br>  |

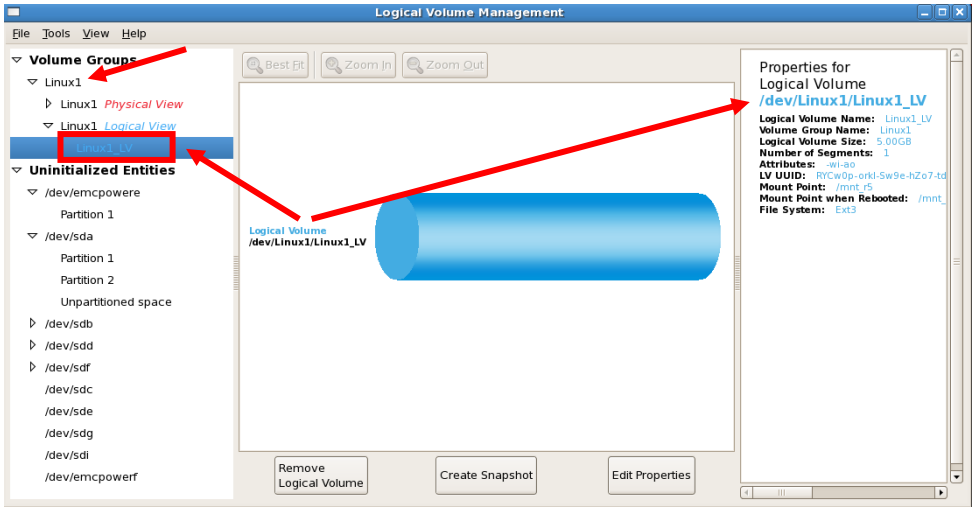


EMC² where information lives®

| Step | Action |
|---|---|
| 9 | Name the new Logical Volume<br><br>• Give it an **LV name** of Linux1_LV<br>• Click on **Use remaining** to use the remaining free space of the Logical Volume in the Volume Group<br>• Give it a Filesystem of Ext3<br>• Check off Mount<br>• Check off Mount when rebooted<br>• Give it a mount pount of **/mnt_r5**<br>• Click OK<br><br>Example:<br><br>  |
| 10 | Click Yes to create the new mount point.<br><br>Example:<br><br>  |

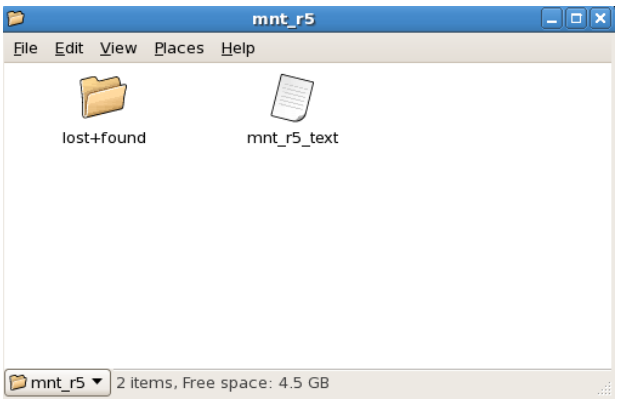


EMC² where information lives®

| Step | Action |
|---|---|
| 11 | When the task completes you should see you new Linux1_LV logical volume under the Linux1 Volume Group.<br><br>• What types of information can you tell from the Properties for Logical Volume properties on the right-hand side of the screen?<br><br>_____<br><br>_____<br><br>  |



EMC² where information lives®

| Step | Action |
|---|---|
| 12 | From a terminal window navigate to the new drive and place a new text file on it.<br><br>Note: We use the CLI for the following steps but if you wish you may use the GUI. See below in Example 2.<br><br>• Use a df –k command to see the newly mounted drive<br>• Create a new file call touch mnt_r5_text on the drive<br>• Make sure you leave the drive so there are no open handles on it<br><br>Example 1:<br><br>**[root@SAN-6 ~]# df -k**<br><br>**Filesystem 1K-blocks Used Available Use% Mounted on**<br><br>**/dev/sda2 14067580 3588364 9753080 27% /**<br><br>**tmpfs 2075920 8 2075912 1% /dev/shm**<br><br>**/dev/mapper/Linux1-Linux1_LV**<br><br>**5156480 141440 4753104 3% /mnt_r5**<br><br>**[root@SAN-6 ~]# cd /mnt_r5**<br><br>**[root@SAN-6 mnt_r5]# ls**<br><br>**lost+found**<br><br>**[root@SAN-6 mnt_r5]# touch mnt_r5_text**<br><br>**[root@SAN-6 mnt_r5]# ls**<br><br>**lost+found mnt_r5_text**<br><br>**[root@SAN-6 mnt_r5]# cd /**<br><br>**[root@SAN-6 /]#**<br><br>• This can also be done through the GUI<br><br>Example 2:<br><br>  |

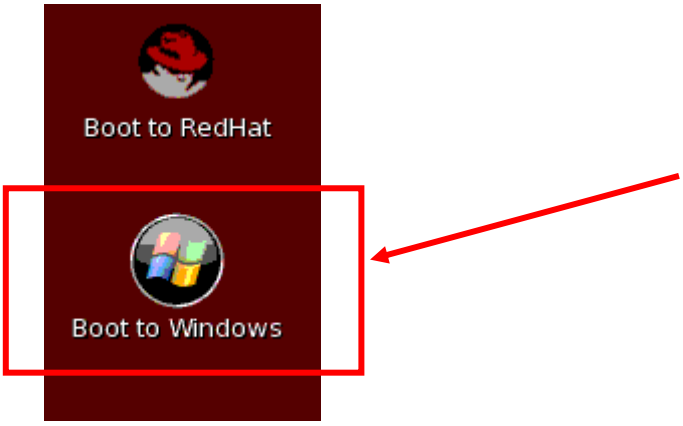
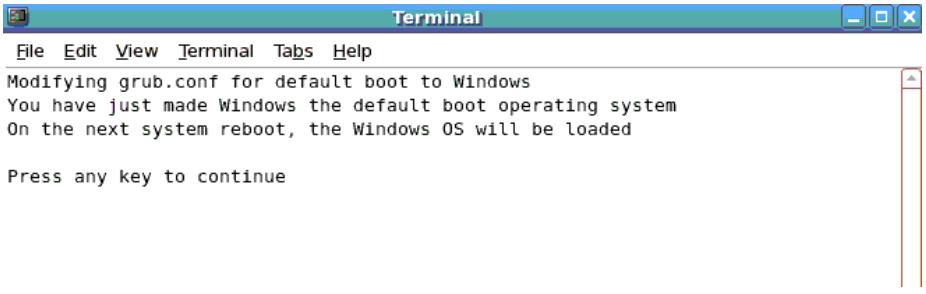


EMC² where information lives®

| Step | Action |
|---|---|
| 13 | **Repeat all of these steps for your Raid 6 LUN as well.**<br><br>• Information needed to create the drive is as follows<br>  ○ Volume Group Name = Linux2<br>  ○ Logical Volume = Linux2_LV<br>  ○ Use all of the free space of the Logical Volume in the Volume Group<br>  ○ Give it a Filesystem of Ext3<br>  ○ Check off Mount<br>  ○ Check off Mount when rebooted<br>  ○ Give it a mount pount of **/mnt_r6**<br>  ○ Create a new file called mnt_r6_text on the drive |
| 14 | **Verify the mount points are seen in the VNX Array:**<br><br>• In Unisphere, navigate to **Hosts > Storage Groups**<br>• Go to the **Host** tab and on the right hand side under **Host Management** select **Connect Host.**<br>• Type in your **SAN-X** host **IP address** in the **Enter Host IP Address** field.<br>• Under Volumes on Block Storage Systems verify that your mount volumes are present.<br><br>**NOTE: This step may be a bit problematic for you as it was in the writing of this lab. This is because of the dual boot nature of the hosts we are working with in our student labs.** |

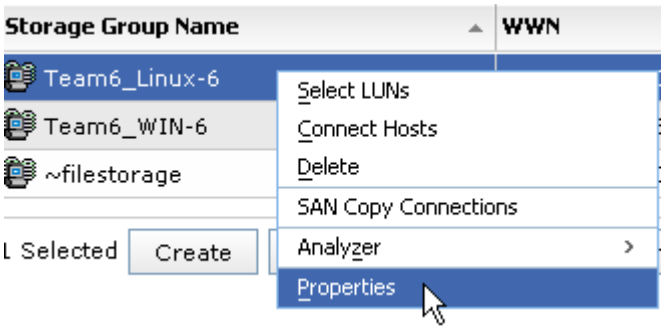
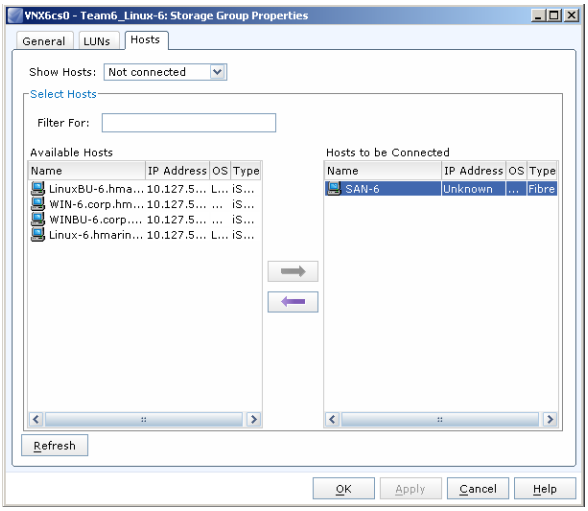
*End of Lab Exercise 5 Part 5*

# Lab 5: Part 6 - Remove the the Linux Host from the Storage Group in prepartion to work with Windows again

| Step | Action |
|---|---|
| Note | **REMINDER: Please remember that in order to do both sets of labs for Windows *and Linux* , you will need to remove the Windows Production host from the TeamX_WIN-X storage group in order to put the RedHat Production host into the TeamX_LIN-X storage group and vice-versa each time you need to work on one or the other in a lab.**<br><br>**This cannot be avoided with dual-booted hosts!** |
| 1 | **Prepare to Reboot the Linux host into Windows by double-clicking on the Boot to Windows icon on the desktop.**<br><br>  <br><br>• This will bring up a Terminal Window. Read the message that the batch job echos and confirm you have just setup Windows as the default boot OS.<br>• Hit the spacebar to close the terminal window and go to the next step.<br><br>  |

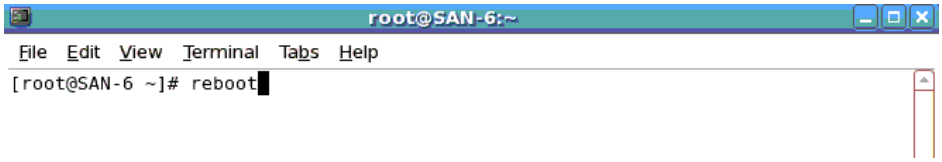


EMC² where information lives®

| Step | Action |
|---|---|
| 2 | **In Unisphere open the Properties of your Linux Host from its storage group.**<br>• If needed then login to Unisphere from your Linux machine with your **sysadmin** account credentials.<br>• From the Dashboard view, select your **VNX** from the All System dropdown lists.<br>• Click **Hosts > Storage Groups** from the navigation bar.<br>• Right-mouse click on your Storage Group and choose Properties<br>Example:<br>  |
| 3 | **Remove the Linux server from the Storage Group**<br>• In the Properties screen remove your Linux SAN-X host by hightlighting the host in the “Hosts to be Connected” column and moving it to the “Available Hosts” column.<br>• Click Apply, Yes to the Confirmation Message and OK to the Success Message<br>• Then OK to Close the Storage Group Proprties screen<br>  |



EMC² where information lives®

| | |
|---|---|
| 4 | **Prepare the Windows Hosts to be used once again by adding it back to it's storage group**<br>• From the Storage Group window select your **TeamX_Win-X** storage group and click **Properties.**<br>• Click the Hosts tab. Select your Physical Windows host (SAN-X where X is your team number) from the **Available Hosts** pane and click the → .to move the hosts to the Hosts to be Connected pane. Click OK, Yes, OK. |
| 5 | **Reboot the Linux host into Windows by running a Reboot from a Terminal window**<br>  <br>• **The host should reboot at this point.** |
| 6 | **Wait an appropriate amount of time and log back into your Windows 2008 server.**<br>• Give the server sufficient time to reboot and then open the GUI to your Windows server through your Student Web Presentation page. |
| 7 | **Check the Windows 2008 Logical Volume Manager**<br>• Using Logical Disk Management verify that all of your disks and file systems are operational. |
| Note | **You are ready to move on to the next part of the Labs** |

*End of Lab Exercise 5 Part 6*

# Lab 5: Part 6 Addendum – Partition Linux Devices through the Command Line Interface

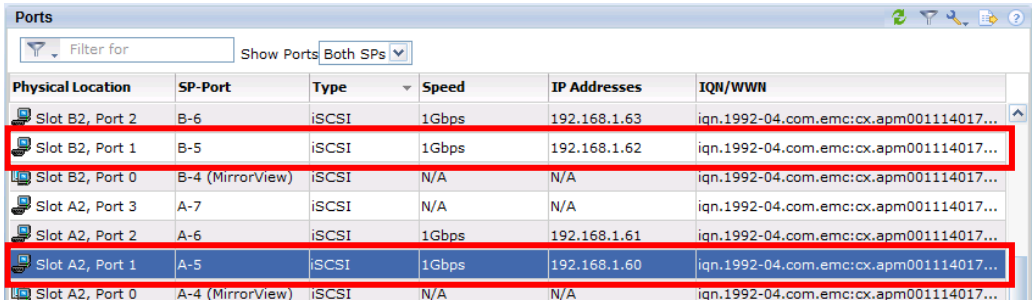
<table>
<tr><td>Note</td><td colspan="2">These steps are provided as EXAMPLE steps of how to format your LUNs for your Linux Server. Please read through the steps in the LVM lab, Lab 5: Part 5 - Configure Linux Host Access to LUNs, so you know how they compare to the steps below.</td></tr>
<tr><td>INFO</td><td>Raid 5 LUN as information needed.<ul><li>Information needed to create the drive is as follows<ul><li>Volume Group Name = Linux1</li><li>Logical Volume = Linux1_LV</li><li>Use all of the free space of the Logical Volume in the Volume Group</li><li>Give it a Filesystem of Ext3</li><li>Give it a mount pount of /mnt_r5</li><li>Create a new file call touch mnt_r5_text on the drive</li></ul></li></ul></td><td>Raid 6 LUN as information needed.<ul><li>Information needed to create the drive is as follows<ul><li>Volume Group Name = Linux2</li><li>Logical Volume = Linux2_LV</li><li>Use all of the free space of the Logical Volume in the Volume Group</li><li>Give it a Filesystem of Ext3</li><li>Give it a mount pount of /mnt_r6</li><li>Create a new file call touch mnt_r6_text on the drive</li></ul></li></ul></td></tr>
</table>



EMC² where information lives®

| | |
|---|---|
| 1 | **Partition the disk and create a file system on the pseudo-device:**<br><br>• From your **Linux-X** host (Putty command prompt), run the following commands:<br>  ○ Type **fdisk /dev/emcpowere**<br>  ○ A warning will appear. To get to the help menu type **m**<br>  ○ Create a new partition. Type **n**<br>  ○ Create a Primary Partition. Type **p**<br>  ○ For the number of Partitions type **1**<br>  ○ For the first cylinder type in the maximum amount.<br>  ○ Write Table to disk and exit. Type **w**<br><br>  ○ Type **fdisk /dev/emcpowerf**<br>  ○ A warning will appear. To get to the help menu type **m**<br>  ○ Create a new partition. Type **n**<br>  ○ Create a Primary Partition. Type **p**<br>  ○ For the number of Partitions type **1**<br>  ○ For the first cylinder type in the maximum amount.<br>  ○ Write Table to disk and exit. Type **w**<br><br>This will create emcpower**e1** and emcpower**f1**.<br><br>• From your **Linux-X** host (Putty command prompt), run the following commands:<br>  ○ Type **mkfs.ext3 /dev/emcpowere1**<br>  ○ Type **mkfs.ext3 /dev/emcpowerf1**<br>• From your **Linux-X** host (Putty command prompt), run the following commands:<br>  ○ Create a mount point for the device. Type **mkdir /mnt_5**<br>  ○ Create a mount point for the device. Type **mkdir /mnt_6** |
| 2 | **Mount and verify the device:**<br><br>• From your **Linux-X** host (Putty command prompt), run the following commands:<br>  ○ Type **mount /dev/emcpowere1 /mnt_5**<br>  ○ Type **mount /dev/emcpowerf1 /mnt_6** |
| 3 | **Verify the mounts are seen by the VNX:**<br><br>• In Unisphere, navigate to the **Host** tab and on the right hand side under **Host Management** select **Connect Host.**<br>• Type in your **SAN-X** host **IP address** in the **Enter Host IP Address** field.<br>• Under Volumes on Block Storage Systems verify that your mount volumes are present.<br>• Close Unisphere |

# Lab 5: Part 7 – VNX iSCSI Port Configuration Information Confirmation

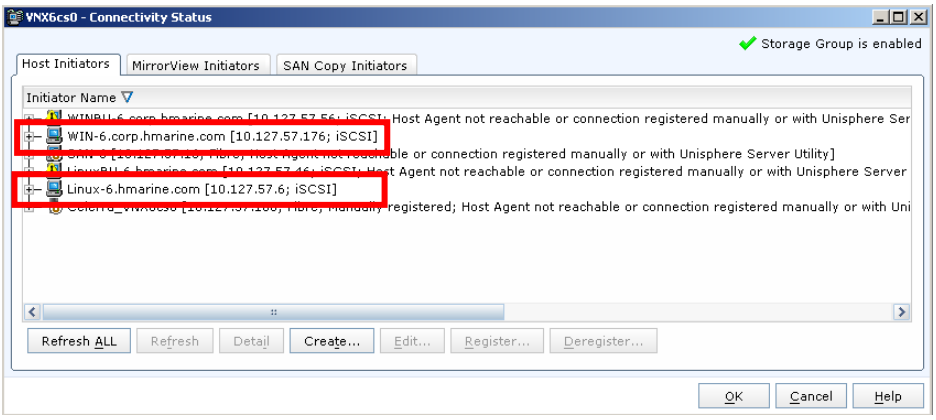
| Step | Action |
|---|---|
| **Note**<br><br>**PLEASE READ!** | **In these following labs, for Windows and Linux, you will be confirming the configuration of iSCSI connectivity of the Virtual Machine (VM) hosts that have been assigned to your team. See Appendix F for details. You will not need to be concerned with dual-booting because these are <u>two separate VMs</u> that have been assigned to your team. These hosts will also be used specifically for later labs that deal with SnapView Snaps, SnapView Clones and SnapSure Snapshots.** |
| 1 | **Open the Port Management screen.**<br><br>• From the "Settings" menu, select "Network", then select "Settings for Block". This will bring up the Port Management screen.<br>• You can choose to filter by "type" if you wish to. This will make it easier to see which types of ports you currently have configured. |
| 2 | **Verify Properties**<br><br>• In the "Port Management" window, click on the iSCSI ports (Windows hosts connect to A5/B5 and Linux to A6/B6) whose network parameters were assigned to your Team to verify and click Properties.<br><br>  |
| 3 | **Verify the IQN is displayed and note the "Physical Port Properties" values.**<br><br>• Selecting "ADD" from the window will launch the IPv4 Configuration dialog box in iSCSI Virtual Port Properties window appears. This is where the user would enter the configuration information on a new system. DO NOT ADD PORTS.<br>• Click on the "Virtual Port 0" and select Properties<br>• Take a moment to review the parameters for the port.<br><br>**Note: These ports are pre-configured for this lab and should not be changed!** |

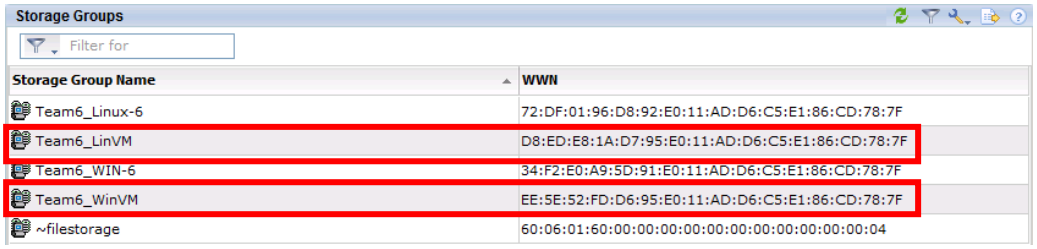


EMC² where information lives®

| Step | Action |
|---|---|
| 4 | **Select "Cancel" to exit and return to the Port Management dialog box and click OK to close the Port Management window.**<br><br>*End of Lab Exercise 5 Part 7* |

## Lab 5: Part 8 – Create and Populate Storage Groups for Windows & Linux iSCSI Hosts

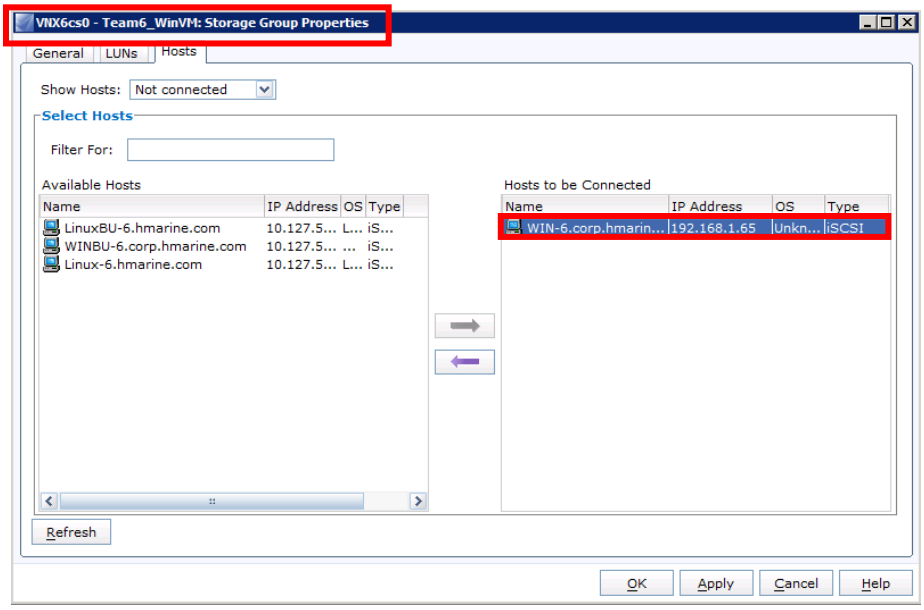
| Step | Action |
|---|---|
| 1 | **Check Connectivity Status to see if your Teams Windows VM and Linux VM hosts have been discovered.**<br><br>• Click Hosts > then click on Connectivity Status from the Host Management menu.<br>• Verify your VM iSCSI hosts are present. (If the hosts are not present then please contact your instructor.)<br><br>**Example display:**<br>  |

| Step | Action |
|---|---|
| 2 | **Create two Storage Groups for your Windows and Linux VM Hosts:**<br><br>• Click Hosts > Storage Groups from the navigation bar.<br>• From the Storage Groups window click Create.<br>• Note: If there is a storage group already created please ignore it.<br>• Name the first Storage Group: TeamX_WinVM (where X is your team number). Click OK.<br>• A message will ask you "if you would like to add LUNs and connect host to the storage group", click **No**.<br><br>• Name the second Storage Group: TeamX_LinVM (where X is your team number). Click OK.<br>• A message will ask you "if you would like to add LUNs and connect host to the storage group", click No.<br><br>**Example:**<br><br>  |



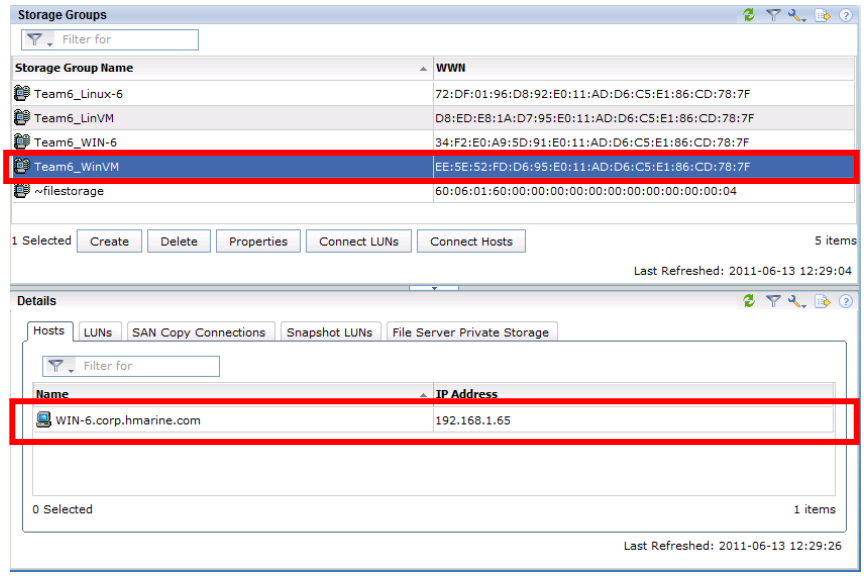
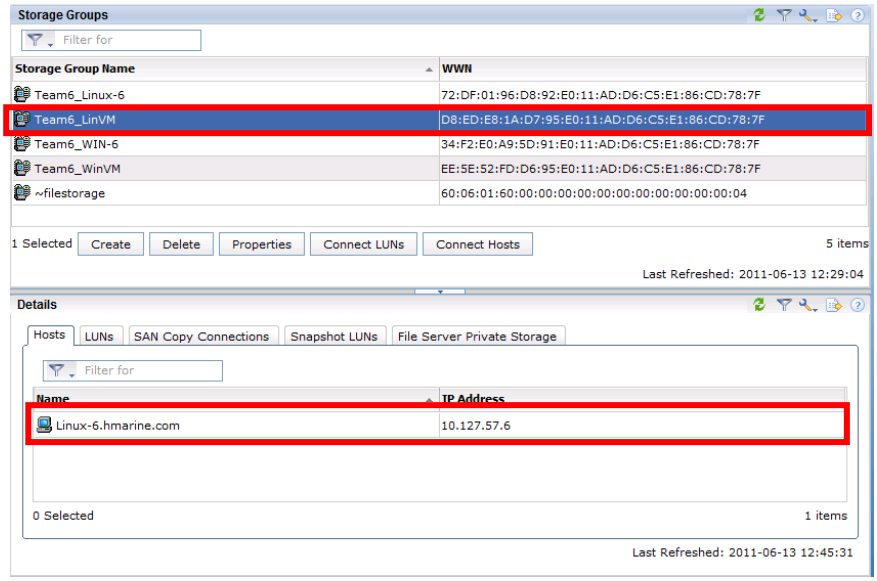


EMC² where information lives®

| Step | Action |
|---|---|
| 3 | **Add your VM Hosts to the new Storage Groups:**<br><br>• From the Storage Group window select your TeamX_WinVM storage group and click Properties.<br>• Click the Hosts tab. Select your Windows host (Win-X where X is your team number) from the Available Hosts pane and click the → to move the hosts to the Hosts to be Connected pane. Click **OK**, Yes, **OK.**<br><br>**Example:**<br><br>  <br><br><br>• Repeat these same steps for your Linux Host! |



EMC² where information lives®

| Step | Action |
|---|---|
| 4 | **Verify that the Hosts have been assigned to the proper Storage Groups.**<br><br>• In the Storage Groups window, click on each of the new Storage Groups and verify in the Details section that the Hosts<br><br>**Example:**<br><br>  <br><br><br>  <br> |

*End of Lab Exercise 5*



EMC² where information lives®

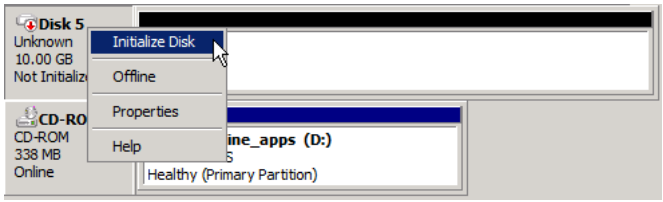
| | |
|---|---|
| **Purpose:** | To create a VNX metaLUN, using EMC Unisphere, and make the additional space available to a Windows host. To migrate a VNX LUN.<br><br>You will be using your **Physical Windows host** (**SAN-X** where X is your team number) for the following labs. Your physical host should still be booted into the Windows operating system from Lab Exercise 5, Part 6. |

| | |
|---|---|
| **Tasks:** | Students will perform the following tasks:<br><br>• Expanding Pool LUNs – Thick<br>• Expanding Pool LUNs – Thin<br>• Create a VNX metaLUN<br>• Use Unisphere to view metaLUN properties |



EMC² where information lives®

# Lab 6: Part 1 – Expanding Pool LUNs

| Step | Action |
|---|---|
| 1 | **System Login:**<br>• Login to Unisphere from your **Physical Windows host** (**SAN-X** where X is your team number) with your sysadmin account credential.<br>• From the Dashboard view, select your **VNX** from the All System dropdown lists and navigate to **Storage > LUNs > LUNs**. |
| 2 | **Expand a Thick LUN:**<br>• From the **LUNs** window, right-click LUN **T0_LUN_0** and click **Expand.**<br>• From the **LUN Expand Storage dialog**, type in a New User Capacity of **10** (GB) and click OK.<br>• From the LUNs window, verify that T0_LUN_0 now has a **User Capacity** of **10 GB** |
| 3 | **Add T0_LUN_0 to a Storage Group:**<br>• Navigate to **Hosts > Storage Groups**.<br>• Select your **TeamX_Win-X** (where X is your team number) **storage group** and click **Connect LUNs**.<br>• Expand the **Pool 0** container, select **T0_LUN_0** and click **Add** to put it in the **Selected LUNs** window. Click OK, Yes, OK. |
| 4 | **Navigate to the Disk Management menu on your Windows Workstation:**<br>• On your **Windows Server**, click **Start** and right-click **Computer**. Select **Manage**.<br>• From the **Server Manager** window, expand the **Storage** container and select **Disk Management**.<br>• If an Initialize Disk menu does not launch then locate the new disk, right-mouse click on the Disk Name and launch Inilitialize Disk.<br>  <br>• For the selected disk use the default **MBR (Master Boot Record)** for the partition style and click OK. |



EMC² where information lives®

| Step | Action |
|---|---|
| 5 | **Create a New Simple Volume for the Expanded Disk:**<br><br>• For the **one unallocated disk** do the following steps:<br>  ○ Right click the **unallocated** section next to a disk and select **Create New Simple Volume.**<br>  ○ The **New Simple Volume Wizard** will appear. Click Next.<br>  ○ For the **Specify Volume Size** make sure the **Simple volume size in MB** matches the **Maximum disk space in MB** amount and click Next.<br>  ○ For **Assign the following drive letter** use the **default** and click Next.<br>  ○ For **Format Partition** use the defaults and click Next.<br>  ○ Review your configuration and click **Finish**.<br>• Close Server Manager |
| 6 | **Verify Simple Volumes on your Windows Server:**<br><br>• On your Windows Server click Start and click Computer. You should now see one new volume.<br><br>What is the drive letter for the new volume? _____ |
| 7 | **Expand a Thin LUN:**<br><br>• Navigate to **Storage > LUNs > LUNs**.<br>• From the **LUNs** window, right-click LUN **t0_LUN_2** and click **Expand.**<br>• From the **LUN Expand Storage dialog**, type in a New User Capacity of **15** (GB) and click OK.<br>• From the LUNs window, verify that t0_LUN_2 now has a **User Capacity** of **15 GB** |
| 8 | **Add t0_LUN_2 to a Storage Group:**<br><br>• Navigate to **Hosts > Storage Groups**.<br>• Select your **TeamX_Win-X** (where X is your team number) **storage group** and click **Connect LUNs**.<br>• Expand the **Pool 0** container, select **t0_LUN_2** and click **Add** to put it in the **Selected LUNs** window. Click OK, Yes, OK. |
| 9 | **Navigate to the Disk Management menu on your Windows Workstation:**<br><br>• On your **Windows workstation**, click **Start** and right-click **Computer**. Select **Manage**.<br>• From the **Server Manager** window, expand the **Storage** container and select **Disk Management**.<br>• An Initialize Disk menu will launch.<br>• For the selected disk use the default **MBR (Master Boot Record)** for the partition style and click OK. |

| Step | Action |
|---|---|
| 10 | **Create a New Simple Volume for the Expanded Disk:**<br><br>• For the **one unallocated disk** do the following steps:<br>  ○ Right click the **unallocated** section next to a disk and select **Create New Simple Volume.**<br>  ○ The **New Simple Volume Wizard** will appear. Click Next.<br>  ○ For the **Specify Volume Size** make sure the **Simple volume size in MB** matches the **Maximum disk space in MB** amount and click Next.<br>  ○ For **Assign the following drive letter** use the **default** and click Next.<br>  ○ For **Format Partition** use the defaults and click Next.<br>  ○ Review your configuration and click **Finish**.<br>• Close Server Manager |
| 11 | **Verify Simple Volumes on your Windows Workstation:**<br><br>• On your Windows Workstation click Start and click Computer. You should now see one new volume.<br><br>What is the drive letter for the new volume? _____ |

*End of Lab Exercise 6 Part 1*

# Lab 6: Part 2 – Expanding RAID Group LUNs

| Step | Action |
|---|---|
| 1 | **Renaming a LUN:**<br><br>• Navigate to **Storage > LUNs > LUNs**.<br>• Locate **RG5_ LUN_50** from the LUNs window and select **Properties**.<br>• From **LUNs name**, rename the LUN to **Base_RG5_LUN_50** and click OK, Yes, OK. |
| 2 | **Expand Storage Wizard (Striping):**<br><br>• Right-click **Base_ RG5_LUN_50** and select **Expand**.<br>• The **Expand Storage Wizard** will appear. Click **Next**.<br>• From the **Select Expansion Type** window leave the default as **Striping** and click **Next**.<br>• A warning will appear saying that "this operation may take a long time to complete." Click Yes.<br>• From the select **Unused LUNs** window select **RG5_LUN_51** and click **Next.**<br>• From the **Specify new LUN Capacity** window click the **GB** and **Maximum Capacity** buttons and click **Next**<br>• From the **Specify new LUN Settings** window keep the defaults and click Next.<br>• From the **Summary** window, review your configuration and click **Finish**.<br>• From the **Results from the LUN Expansion Wizard** window, once the operation is shown as successful initiated, click Finish |
| 3 | **View the component LUNs:**<br><br>• From the LUNs window, when the expansion completes, the **Base_RG5_LUN_50** LUN icon will change to represent a **metaLUN**<br>• From the LUNs window, right-click **Base_RG5_LUN_50** and select **Show Component LUNs**.<br>• Expand the **Component 0** container.<br><br>What LUN IDs were assigned for each component? _____ |



EMC² where information lives®

| Step | Action |
|---|---|
| 4 | **View LUN Properties:**<br><br>• Select **Base_RG5_LUN_50** and click **Properties**. Click the **General** tab.<br><br>What metaLUN number is assigned to **Base_RG5_LUN_50**?_____<br><br>• Click the **Host** tab<br><br>What's the logical device (**disk drive**) name associated with **Base_RG5_LUN_50**?_____<br><br>• Click the **Folders** tab.<br><br>To what folders does Base_RG5_LUN_50 belong?_____ |
| 5 | **Claim the additional LUN space on your Windows Workstation:**<br><br>• On your **Windows workstation**, click **Start** and right-click **Computer**. Select **Manage**.<br>• From the **Server Manager** window, expand the **Storage** container and select **Disk Management**.<br>• From the right side of the window select **More Actions** and click **Rescan Disks**.<br>• The **disk drive** associated with **Base_RG5_LUN_50** should now show an unallocated 5 GB partition.<br>• Right click the associated **drive letter partition** (logical device) of **Base_RG5_LUN_50** and click **Extend Volume**.<br>• Read the **Welcome to the Extend Volume Wizard** window and click **Next**.<br>• From the **Select Disks** window keep the defaults and click **Next.**<br>• From the **Completing the Extend Volume Wizard** window, click **Finish.** |
| 6 | **Verify additional space:**<br><br>• From the Disk Management screen, verify that the drive now has a total capacity of 10 GBs. |
| 7 | **Renaming a LUN:**<br><br>• Navigate to **Storage > LUNs > LUNs**.<br>• Locate **RG6_ LUN_56** from the LUNs window and select **Properties**.<br>• From **LUNs name**, rename the LUN to **Base_RG6_LUN_60** and click OK, Yes, OK. |

| Step | Action |
|---|---|
| 8 | **Expand Storage Wizard (Concatenation):**<br><br>• Right-click **Base_ RG6_LUN_60** and select **Expand**.<br>• The **Expand Storage Wizard** will appear. Click **Next**.<br>• From the **Select Expansion Type** window, select **Concatenation** and click **Next**.<br>• A warning will appear saying that "this operation may take a long time to complete." Click Yes.<br>• From the select **Unused LUNs** window select **RG6_LUN_61** and click **Next.**<br>• From the **Specify new LUN Capacity** window click **GB** and **Maximum Capacity** and click **Next.**<br>• From the **Specify new LUN Settings** window keep the defaults and click **Next.**<br>• From the **Summary** window, review your configuration and click **Finish**.<br>• From the **Results from the LUN Expansion Wizard** window, once the operation is shown as successful initiated, click Finish |
| 9 | **View the component LUNs:**<br><br>• From the LUNs window, when the expansion completes, the **Base_RG6_LUN_60** LUN icon will change to represent a **metaLUN**<br>• From the LUNs window, right-click **Base_RG6_LUN_60** and select **Show Component LUNs**.<br>• Expand the **Component 0** and **Component 1** container.<br><br>What LUN IDs were assigned for each component? _____ |
| 10 | **View LUN Properties:**<br><br>• Select **Base_RG6_LUN_60** and click **Properties**. Click the **General** tab.<br><br>What metaLUN number is assigned to **Base_RG6_LUN_60**?_____<br><br>• Click the **Host** tab<br><br>What's the logical device (**disk drive**) name associated with **Base_RG6_LUN_60**?_____<br><br>• Click the **Folders** tab.<br><br>To what folders does Base_RG6_LUN_60 belong?_____ |

| Step | Action |
|---|---|
| 11 | **Claim the additional LUN space on your Windows Workstation:**<br><br>• On your **Windows workstation**, click **Start** and right-click **Computer**. Select **Manage**.<br>• From the **Server Manager** window, expand the **Storage** container and select **Disk Management**.<br>• From the right side of the window select **More Actions** and click **Rescan Disks**.<br>• The **disk drive** associated with **Base_RG6_LUN_60** should now show an unallocated 6 GB partition.<br>• Right click the associated **drive letter partition** (logical device) of **Base_RG6_LUN_60** and click **Extend Volume**.<br>• Read the **Welcome to the Extend Volume Wizard** window and click **Next**.<br>• From the **Select Disks** window keep the defaults and click **Next.**<br>• From the **Completing the Extend Volume Wizard** window, click **Finish.** |
| 12 | **Verify additional space:**<br><br>• From the Disk Management screen, verify that the drive now has a total capacity of 12 GBs.<br>• Close Disk Management.<br>• Close Unispehre. |

*End of Lab Exercise 6*

# Lab Exercise 7: Network and File System Configuration

| | |
|---|---|
| **Purpose:** | To acquire the skills and knowledge to be able to configure a VNX for network access and create and manage a basic file system.<br><br>**In these following networking labs, for Windows and Linux, you will be utilizing the Virtual Machine (VM) iSCSI hosts that have been assigned to your team.**<br><br>**WIN-X (VM Host)**<br><br>**Linux-X (VM Host)**<br><br>(where **X** is your team number)<br><br>**See Appendix F for details.**<br><br>Note: Screenshots used in this Lab Exercise are meant to be used as examples. You may have different values/data on your VNX system. |

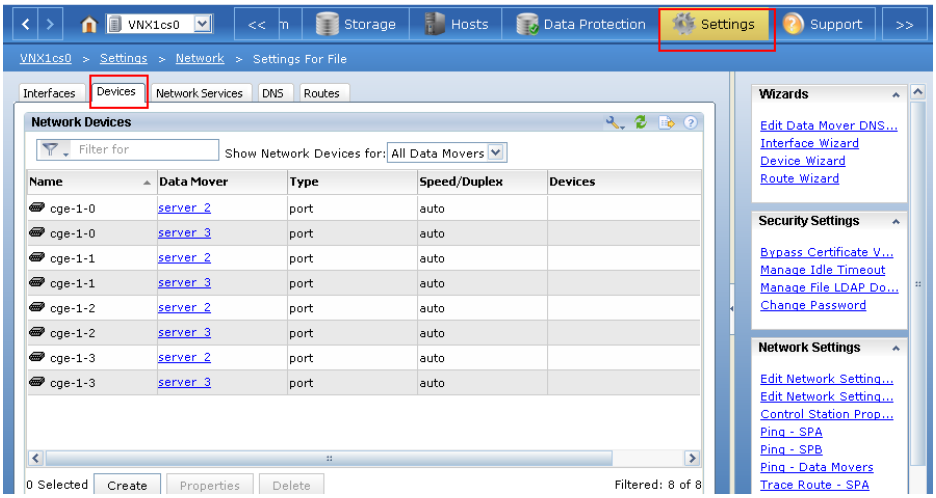
| | |
|---|---|
| **Tasks:** | In this lab exercise, you will perform the following tasks:<br><br>• Configure the VNX for network access<br>• Configure File Systems for VNX<br>• Manage File Systems for VNX |

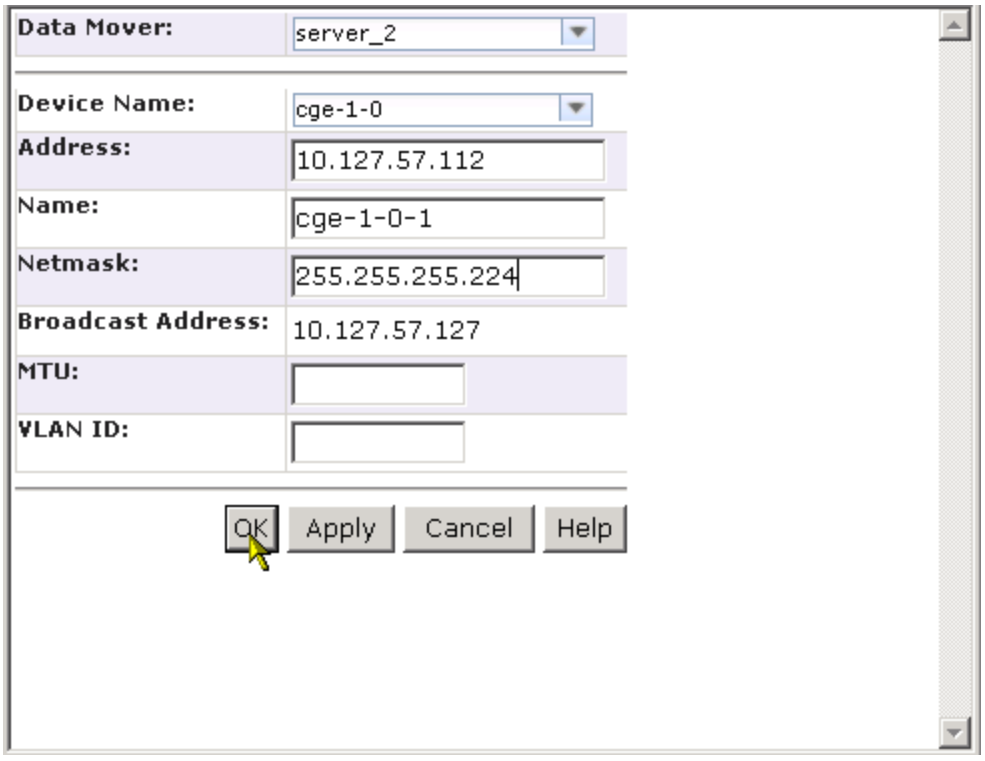
| | |
|---|---|
| **References:** | Configuring and Managing Networking on VNX - P/N 300-011-812 - REV A01<br><br>Managing Volumes and File Systems with VNX™ AVM - P/N 300-011-806 - REV A01 |

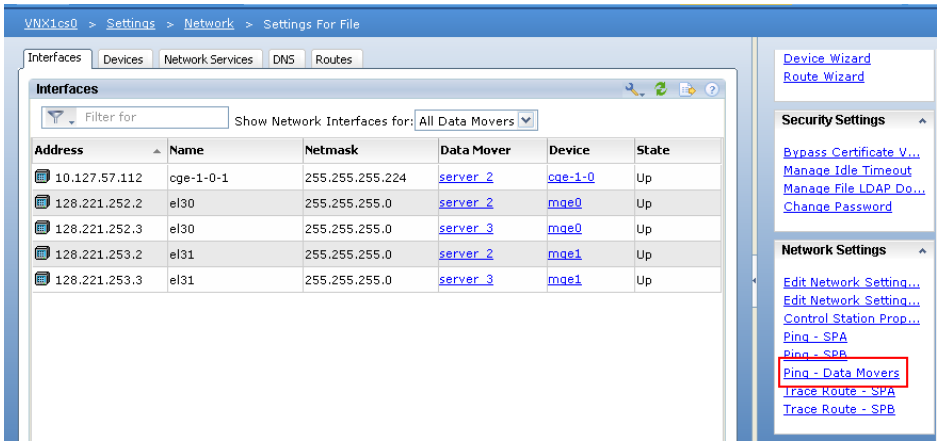
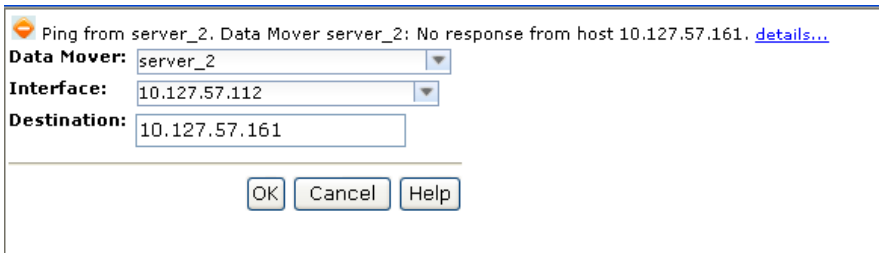


EMC² where information lives®

# Lab 7: Part 1 – Configure Networking on VNX

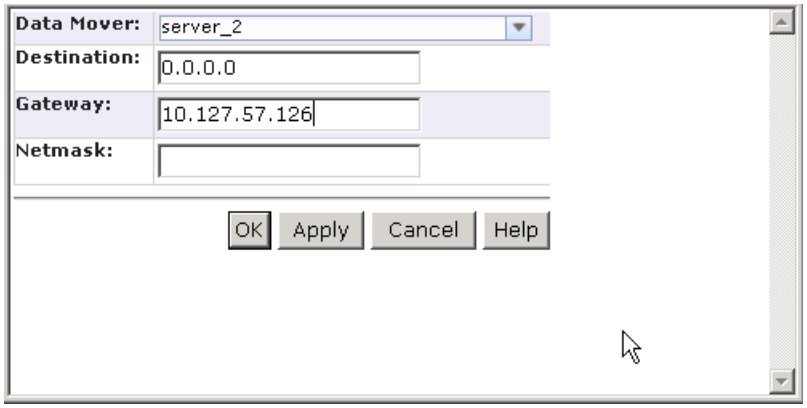
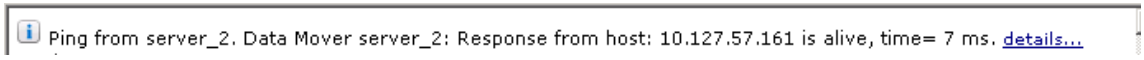
| Step | Action |
|---|---|
| 1 | **System Login:**<br>• Connect to your VM Windows workstation; Win-X and login to Unisphere using your sysadmin credentials (refer to the Appendix for credential information.)<br>• Select your **VNX** from the All Systems drop down menu.<br>• From the Top Navigation bar navigate to **Settings > Network > Settings for File**.<br>• The **Settings For File** main pane has the **Interfaces** tab selected by default, click the **Devices** tab.<br>  |
| 2 | **Configure Data Mover speed and duplex:**<br>• Right-click device name **cge-1-0** for **server_2** and select **Properties**.<br>• Click the arrow on the right side of the **Speed/Duplex** dropdown list and make sure it is set to **auto**.<br> <br>• Click OK.<br>• Click Cancel to close the pop up window<br>**Note:** You do not need to configure the devices for server_3 because it is a standby Data Mover. In the event of failover it will inherit server_2 configuration. |

| Step | Action |
|---|---|
| 3 | **Configure a network interface for server_2:**<br><br>• In the **Settings for File** window click the **Interfaces** tab.<br>• Click **Create** and create a new interface according to the following information:<br><br>  • Data Mover: **server_2**<br>  • Device Name: **cge-1-0**<br>  • Address: **Enter your team's IP address for VNX#_DM2 (where # is your team number) cge-1-0. See Appendix.**<br>  • Name: **cge-1-0-1**<br>  • Netmask: **Enter your team's Netmask address associated with VNX#DM2**<br>  • The **Broadcast Address** is calculated automatically<br>  • Do not enter the **MTU** value<br>  • Do not enter the **VLAN ID** value<br><br>• Click **OK.**<br><br>  |

| Step | Action |
|---|---|
| 4 | **Test Network access:**<br>• Test the network interface by pinging the IP address of your DNS server.<br>• From the right Task pane, under **Network Settings**, click **Ping – Data Movers**.<br>  <br>• Select **server_2** as the **Data Mover** and for the **Interface** select the **IP address previously created**.<br>• Enter the **DNS** IP address as the Destination. See Appendix.<br>• Click **OK**.<br>  <br>You are not able to ping any address outside of your subnet because you have not yet configured a default route for your interface. This is considered normal behavior at this point.<br>• Click **Cancel** |



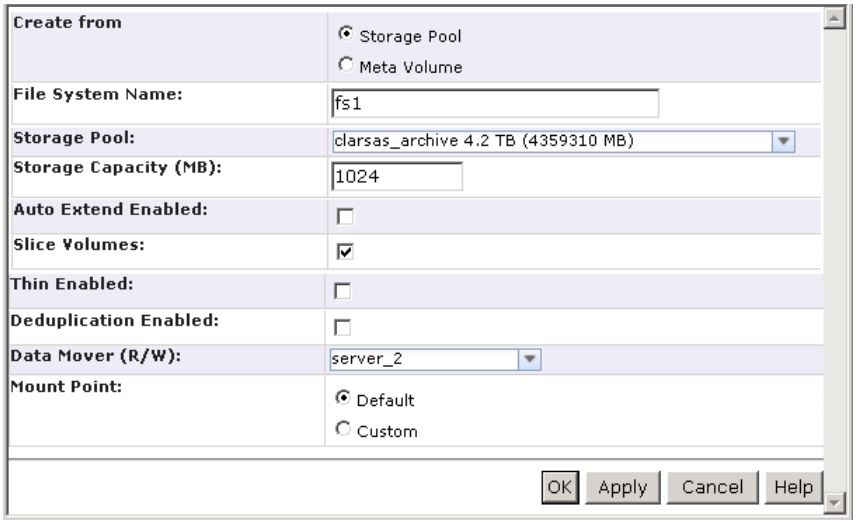
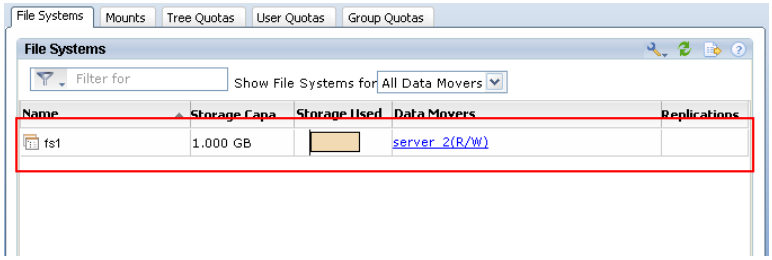
EMC² where information lives®

| Step | Action |
|---|---|
| 5 | **Configure default route and retest network access:**<br><br>• From the **Settings for File** window, click the **Routes** tab.<br>• Click **Create.** Configure the default route as follows:<br>  • Data Mover: **server_2**<br>  • Destination: **0.0.0.0**<br>  • Gateway: **Enter your team's Gateway IP address associated with VNX#_DM2.** See Appendix.<br>  • Netmask: Do not enter a **Netmask** value. It is not required for a default gateway (destination of last resort) and considered optional.<br><br>• Click **OK.**<br>  <br><br>Test the network interface once again by pinging the IP address of the DNS server as previously done.<br><br>• From the right Task pane, under **Network Settings**, click **Ping – Data Movers**<br>• Select **server_2** as the **Data Mover** and for the **Interface** select the **IP address previously created**.<br>• Enter the **DNS** IP address as the Destination. See Appendix.<br>• Click **OK**.<br>• You should now be able to successfully ping the DNS server in your environment.<br><br>  |
| 6 | **Configure DNS service for server_2:**<br><br>• From the **Settings For File** window, select the **DNS** tab.<br>• Click **Create** and enter the following information:<br>  ○ Select a Mover: **server_2**<br>  ○ DNS Domain: **corp.hmarine.com**<br>  ○ DNS Servers: Enter the **DNS** IP address. See Appendix.<br>  ○ Protocol: **UDP**<br>• Click **OK.** |

*End of Lab Exercise 7 Part 1*

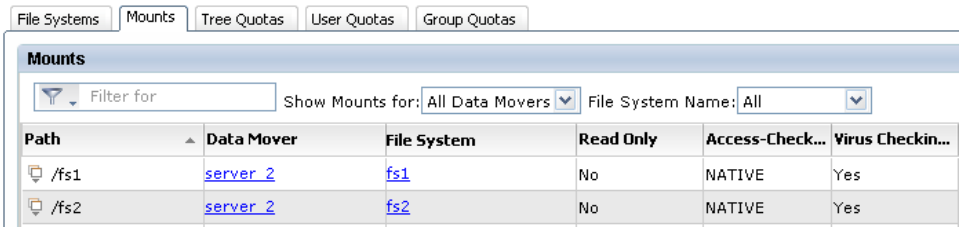
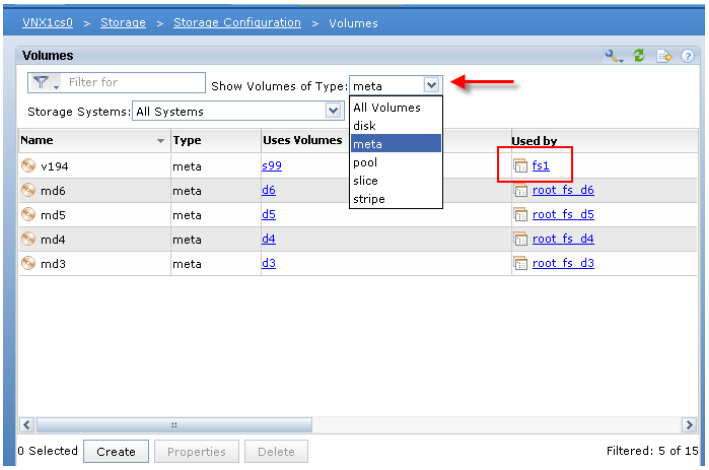


EMC² where information lives®

| Step | Action |
|---|---|
| 1 | **Create File System:**<br><br>• In Unisphere, navigate to **Storage > Storage Configuration > File Systems**<br>• Create a 1 GB file system called **fs1** by clicking **Create** and entering the following information:<br><br>  • Create From: **Storage Pool**<br>  • File System Name: **fs1**<br>  • Storage Pool: **clarsas_r10**<br>  • Storage Capacity (MB): **1024**<br>  • Do not select **Automatic Extend Enabled**<br>  • Verify that **Slice Volumes option** is selected<br>  • Verify **Thin Enabled** is not selected<br>  • Verify **File-level Retention Capability** is not selected (the FLR option will only appear if the license has been enabled)<br>  • Verify **Deduplication Enabled** is not selected<br>  • Data Mover (R/W): **server_2**<br>  • Mount Point: **Default**<br><br>• Click **OK.**<br><br>  <br><br>  <br> |

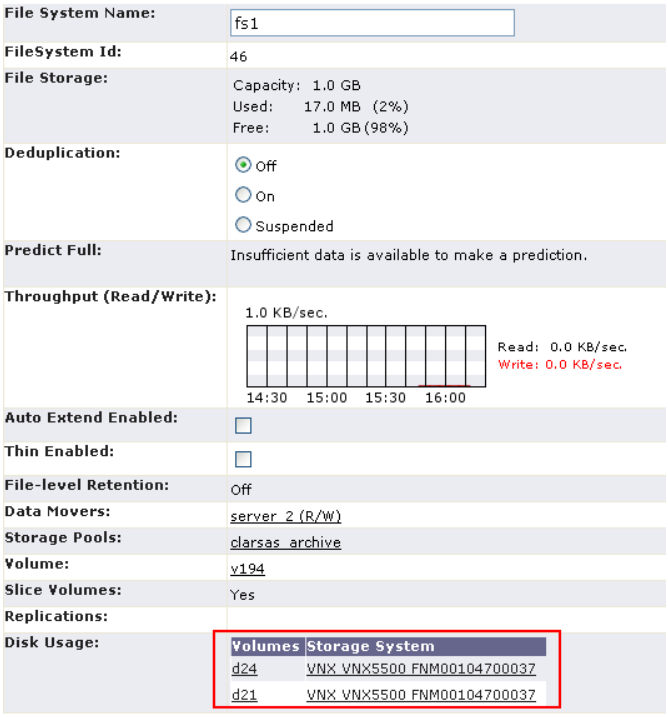


EMC² where information lives®

| Step | Action |
|---|---|
| 2 | **Verify file system mount:**<br><br>Unisphere automatically mounts the file system once it is created if the Default option is selected. Unisphere uses a default mountpoint that is created and named after the file system.<br><br>• From the File Systems window, click the **Mounts** tab.<br>• Verify that the default path/mountpoint created for fs1 is **/fs1**.<br><br>  |
| 3 | **Analyze file system volume structure:**<br><br>• Navigate to **Storage> Storage Configuration >Volumes**.<br>• Select the **Show Volumes of Type: Meta** from the drop down menu.<br>• Find the file system you have just created, fs1, in the **Used By** column.<br><br>  <br><br>1. What Meta Volume does fs1 reside on? (Look in the name column) _____<br><br>2. What other volumes does this Meta Volume use? (Look in the used volumes column) _____<br><br>(This is most likely a Slice Volume which the Metavolume resides on.) |



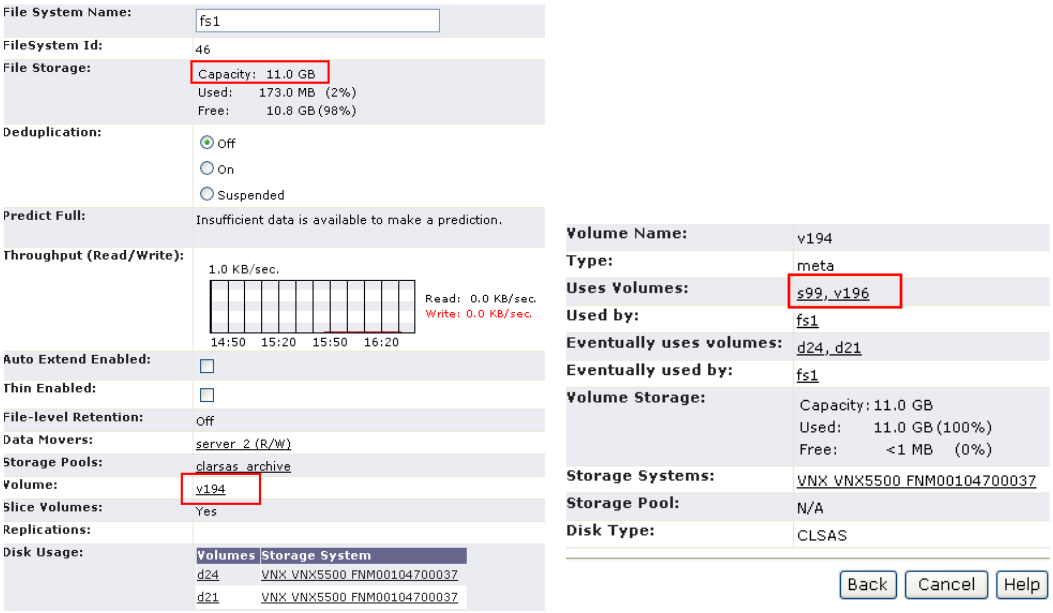
EMC² where information lives®

| Step | Action |
|---|---|
| 4 | • Select the **Show Volumes of Type: Slice** from the drop down menu and look for the volume that you wrote down for question 2 in the last step.<br>• Next, select the **Show Volumes of Type: Stripe** from the drop down menu to see which volume the slice comes from.<br>• Navigate to **Storage > Storage Configuration > File Systems** and double-click on **fs1** to access its properties window.<br>  <br>3. Which disk volumes are being used for fs1? _____ . Disk volumes are the building blocks of file systems.<br>• Close the file system Properties window. |
| 5 | **Extend a file system:**<br>• Extend **fs1** by 10 GB by selecting **fs1** and clicking **Extend.**<br>• Enter the following information in the Extend File System window:<br>Extend from: **Storage Pool**<br>Extend with Storage Pool: **Select the same pool that the file system was created from**.<br>Extend Size by (MB): **10240**<br>• Click **OK, OK**. |





EMC² where information lives®

| Step | Action |
|---|---|
| 6 | **Confirm the size of fs1 and its metavolume:**<br><br>• Double-click fs1 to access its Properties window.<br>• Note the size change on the file system.<br>• Click on the volume that the file system resides on.<br><br>  <br><br><br>1. Which volumes make up your meta volume now? _____<br><br>2. What is the Volume storage capacity? _____<br><br>Extending the file system created a second Metavolume that is 10GB in size. This second Meta was concatenated to the original Meta which fs1 resides on, giving us an 11GB volume.<br><br>• Close Unisphere. |

*End of Lab Exercise 7*



EMC² where information lives®

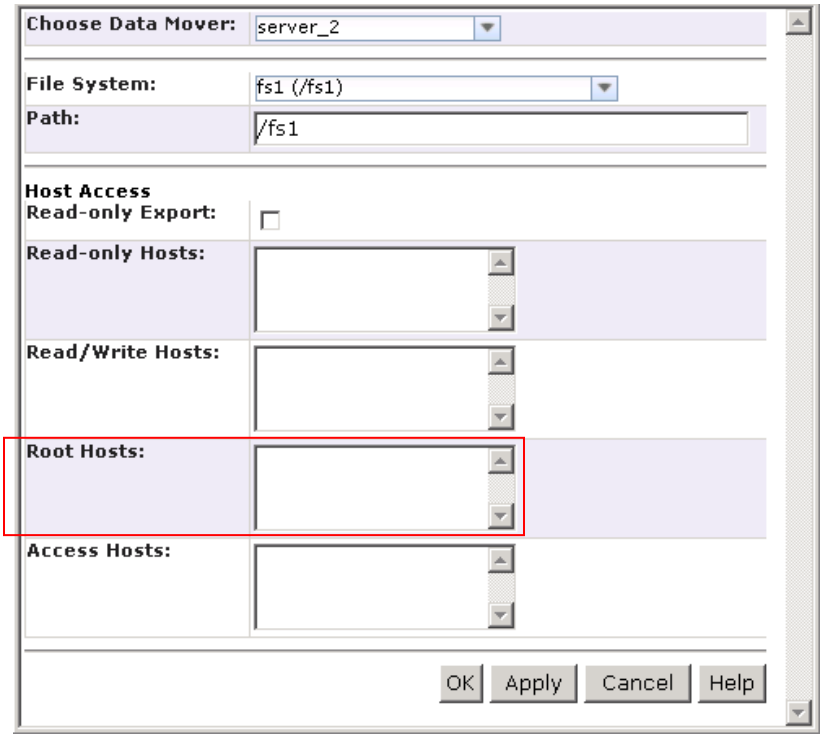
# Lab Exercise 8: NFS File System Export and Permissions

| | |
|---|---|
| **Purpose:** | In these exercises, you will export a file system and assign root privileges to your **Linux-X (VM Host)** host (where **X** is your team number). **See Appendix F for details.** You will also be pairing up with another Team's Linux (VM Host) for one of the labs. A table will guide you as to which host you should pair up with based on which Team you are.<br><br>If you are working with a lab partner, one person sets the configuration while the other observes. Alternate roles from time to time.<br><br>Note: Screenshots used in this Lab Exercise are meant to be used as examples. You may have different values/data on your VNX system. |

| | |
|---|---|
| **Tasks:** | In this lab exercise, you will perform the following tasks:<br><br>• Configure Data Movers to Mount and Export File Systems for your LINUX VM<br><br>• Configure Data Movers to Mount and Export File Systems at sub directory level hiding the directories .etc and lost+found<br><br>• Assign root permissions to an NFS file system |



EMC² where information lives®

| Step | Action |
|---|---|
| 1 | **Export a file system for the NFS protocol:**<br>• Login to Unisphere from one of your Team's Windows workstations (either will do) and select your VNX system<br>• Navigate to **Storage > Shared Folders > NFS**<br>• Click **Create** and enter the following information in the Export window:<br><br>Choose Data Mover: **server_2**<br>File System: **fs1**<br>Path: **/fs1**<br>Root Hosts: **Enter your team's LINUX-# VM** (where # is your team number) **IP address. See Appendix**<br><br>• Click **OK**.<br>  <br>• Click **Refresh** and verify that the /fs1 NFS Export that was just created is visible in the NFS Exports main pane (**Storage > Shared Folders > NFS**).<br>• Minimize the Unisphere window. |



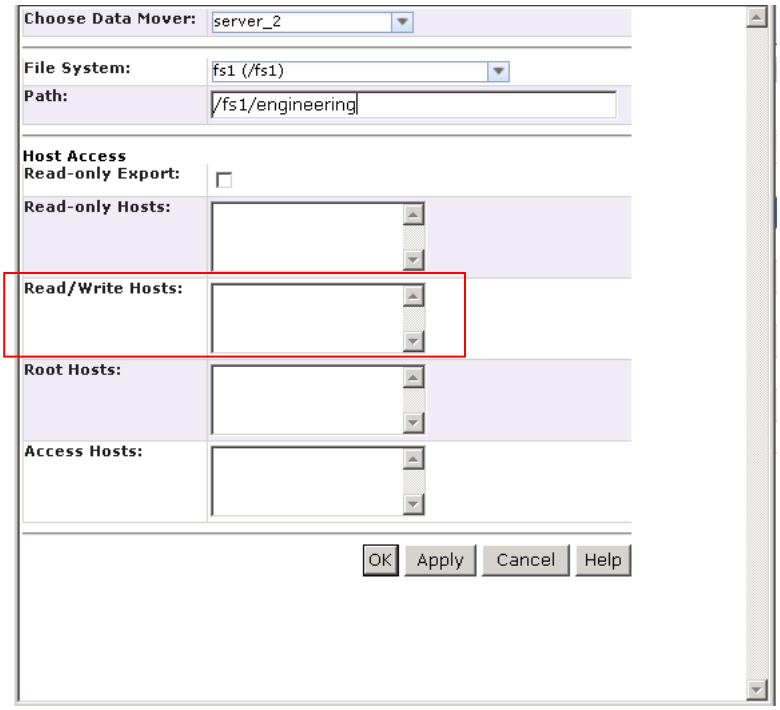


EMC² where information lives®

| Step | Action |
|---|---|
| 2 | **Mount the file system:**<br>• From your Windows workstation, use **Putty** to **SSH** to your Linux workstation by entering your team's Linux-# VM host (where # is your team number) IP address. See Appendix. You may also use the student web presentation page to get to the Linux VM host.<br>• Log in as root and the password is adXmin (where X is your subnet address, see Appendix).<br>• From the command prompt, make a local directory to mount the file system that you have exported via NFS. Type the following:<br>**# cd /**<br>**# mkdir fs1**<br>• Check the contents of your /fs1 directory.<br>**# cd /fs1**<br>**# ls –l**<br>• Can you see the directories .etc and lost+found? **(They should <u>not</u> be visible)**<br>• NFS mount this directory to the exported file system on your Data Mover. Type the following:<br>**# cd /**<br>**# mount** *<IP_of_VNX#_DM2>***:/fs1 /fs1**<br>**# df (confirm that the mount is listed)**<br>**# cd /fs1**<br>**# ls –al**<br>**Note:** By default a new directory is empty. In comparison, the root of a new file system contains lost*+found* and .etc (hidden) directories. Therefore, when you created your /fs1 directory on the client it was empty. However, after NFS mounting it to your Data Mover, /fs1 is now being redirected to a file system showing lost*+found* and .etc |
| 3 | **Create user directory on file system:**<br>• Confirm that you are at /fs1 directory using **pwd** command.<br>• Create a new directory and name it engineering.<br>**# mkdir engineering**<br>• Change the permissions on this directory to **775.** This means read, write, and execute for the owner and group, and read and execute for others.<br>**# chmod 775 engineering**<br>• Change the owner of engineering directory to epallis.<br>**# chown –R epallis engineering** |



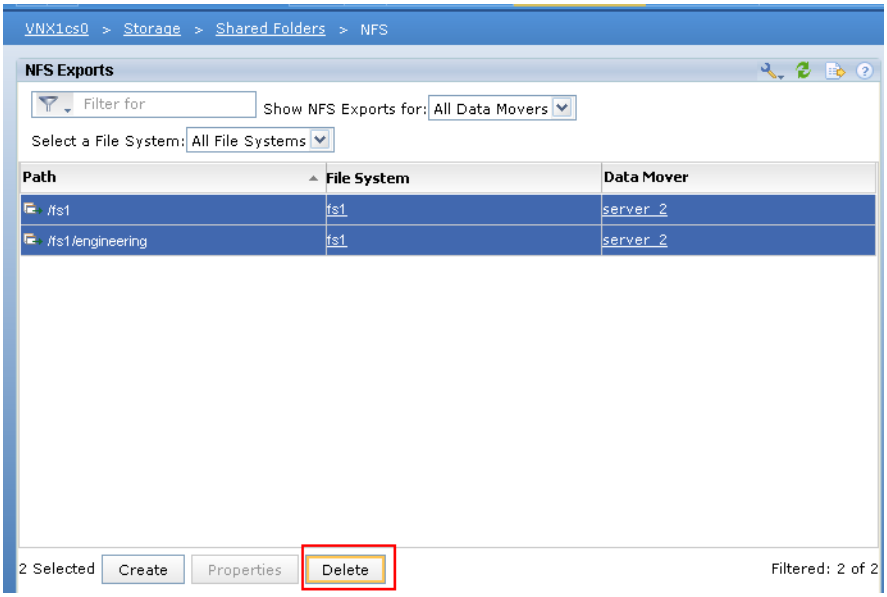
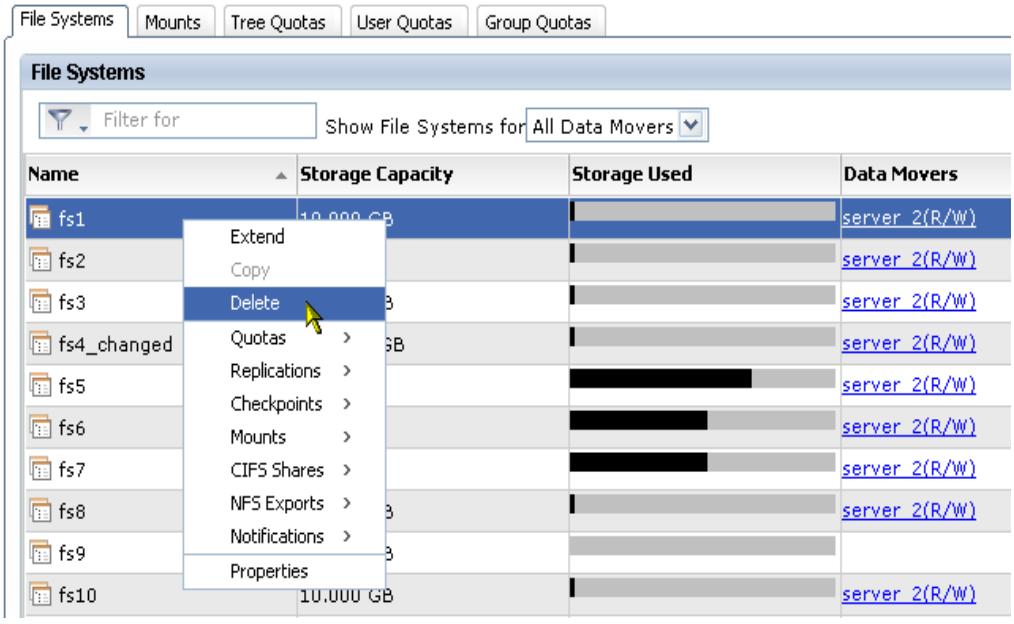
EMC² where information lives®

| Step | Action |
|---|---|
| 4 | • Change the group of engineering directory to **engprop**.<br>**# chgrp -R engprop engineering**<br>• Verify the new permissions on the directory.<br>**# ls -l**<br>`drwxrwxr-x 2 epallis engprop 80 Apr 17 2011 engineering` |
| 5 | **Export a file system at sub-directory level:**<br>• Go back to your Unisphere session and export fs1 file system at sub-directory level as shown below.<br>• Navigate to **Storage >Shared Folders > NFS Create NFS** and click **Create.**<br>• Enter the following information:<br>Choose Data Mover: **server_2**<br>Choose File System: **/fs1**<br>Path: **/fs1/engineering**<br>Read / Write Hosts: (**Enter your Linux-# IP address from the Appendix**)<br>• Click OK<br>  |

| Step | Action |
|---|---|
| 6 | **Mount file system at sub-directory level:**<br>• Using your **Putty** session, mount the new file system export following the steps shown below. Remember you should be logged in as root in order to mount a file system.<br>**# cd /**<br>**# mkdir engdir** (this directory will be used as a mountpoint)<br>**# mount** *<IP_of_VNX#_DM2>*:**/fs1/engineering /engdir**<br>**# df**<br>**# ls -l**<br>`drwxrwxr-x 2 epallis engprop 80 Apr 17 10:44 engdir`<br>Notice that the permissions on the new directory engdir are the permissions you setup earlier. 775 read, write, and execute for the owner and group. Read and execute for others. |
| 7 | **Test directory permissions:**<br>• Open another **Putty** session to your Linux machine and login as **epallis**, password is **password**(See Appendix)<br>• Change directory to **engdir**.<br>**# cd /engdir**<br>**# ls –al**<br>Can you see the directories .etc and lost+found? You should not see them because the file system has been exported on the sub-directory level.<br>• Create a new file and name it **ownerfile**.<br>**# touch ownerfile**<br>Were you able to create a new file? You should be able to create the new file because epallis is the owner of this directory.<br>_____ |

| Step | Action |
|---|---|
| 8 | • Open another Putty session to your Linux machine and login as:<br>**user**: eplace<br>**password:** password<br>• Change directory to **engdir** and create a new file. Name it **groupfile**.<br>`# cd /engdir`<br>`# touch groupfile`<br>Were you able to create a new file? (You should be able to create the new file because eplace belongs to the engprop group which is the directory group)<br>• Open another **Putty** session to your Linux machine and login as **swoo**, password is **password**<br>• Change directory to engdir. Create a new file and name it **groupfile.**<br>`# cd /engdir`<br>`# touch groupfile`<br>Were you able to create a new file? You should not be able to create the new file because the user swoo is neither the directory owner nor belongs to the engprop group. However, swoo still can read and execute. |
| 9 | **Lab cleanup:**<br>• Log off your team's Linux Workstation for users: **swoo**, **eplace**, and **epallis**. Remain logged in as Root.<br>• From the Root login on your LINUX workstation umount and delete mountpoints.<br>`# cd /`<br>`# umount /fs1`<br>`# umount /engdir`<br>`# rmdir fs1`<br>`# rmdir engdir`<br>• Using Unisphere, unexport your file system, **fs1**, by navigating to **Storage > Shared Folders > NFS**.<br>• Highlight the **/fs1** and **/fs1/engineering** exports to be removed and click **Delete** on the bottom of the screen . Click **OK**. |


EMC² where information lives®

| Step | Action |
|---|---|
| 9 |  <br>• Next, delete your file system, fs1, by navigating to **Storage > Storage Configuration > File Systems** and clicking **Delete**, **OK**.<br>• Click the **Mount** tab. Both mountpoints will no longer be available.<br>  <br>**Note:** Deleting the above file system removed the metavolume and all associated stripe and slice volumes. This space has been returned to the Storage Pool for re-use. |

*End of Lab Exercise 8 Part 1*



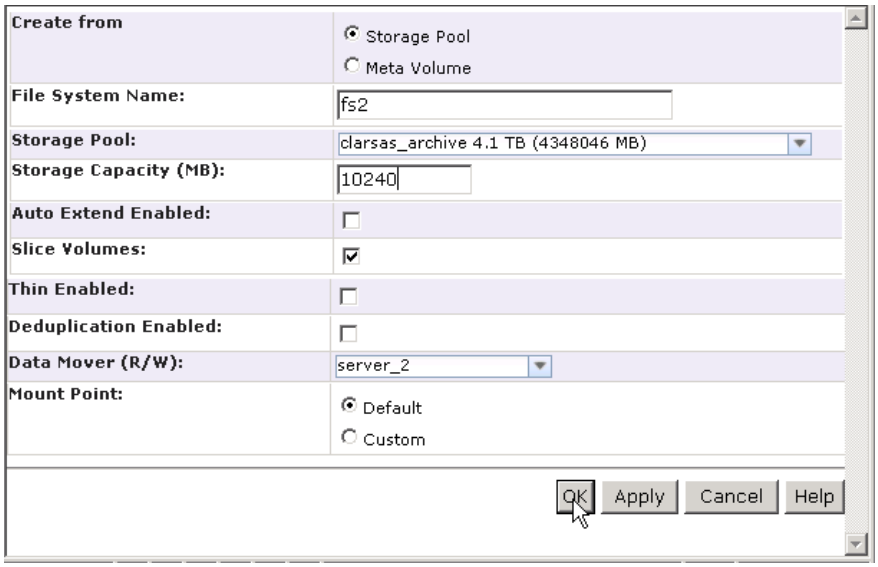
EMC² where information lives®

# Lab 8: Part 2 – Assigning Root Privileges

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>
Preparation:<br>
You will be using two Linux workstations in this lab. Both of them will be VMs, there are NO Physical Hosts used during this lab! The Linux workstation for your team will be referred to as <u>YOUR</u> Linux workstation. The Linux workstation from the list below will be referred to as your <u>OTHER</u> Linux workstation. Before you begin this exercise, record the following information:<br><br>
The IP address of <u>YOUR</u> Linux workstation:<br><br>
10.127. _____. _____<br><br>
The IP address your <u>OTHER</u> Linux workstation (See table below):<br><br>
10.127. _____. _____<br><br>
Use the following table to learn what <u>OTHER</u> Linux workstation to use in this lab. For example, if you are Team1, <u>YOUR</u> Linux is Linux-1 your OTHER Linux is Linux-2.<br><br>
<table>
<tr><th>YOUR Linux</th><th>OTHER Linux</th></tr>
<tr><td>Linux-1</td><td>Linux-2 (10.127.*.2)</td></tr>
<tr><td>Linux-2</td><td>Linux-1 (10.127.*.1)</td></tr>
<tr><td>Linux-3</td><td>Linux-4 (10.127.*.4)</td></tr>
<tr><td>Linux-4</td><td>Linux-3 (10.127.*.3)</td></tr>
<tr><td>Linux-5</td><td>Linux-6 (10.127.*.6)</td></tr>
<tr><td>Linux-6</td><td>Linux-5 (10.127.*.5)</td></tr>
</table>
</td></tr>
</table>



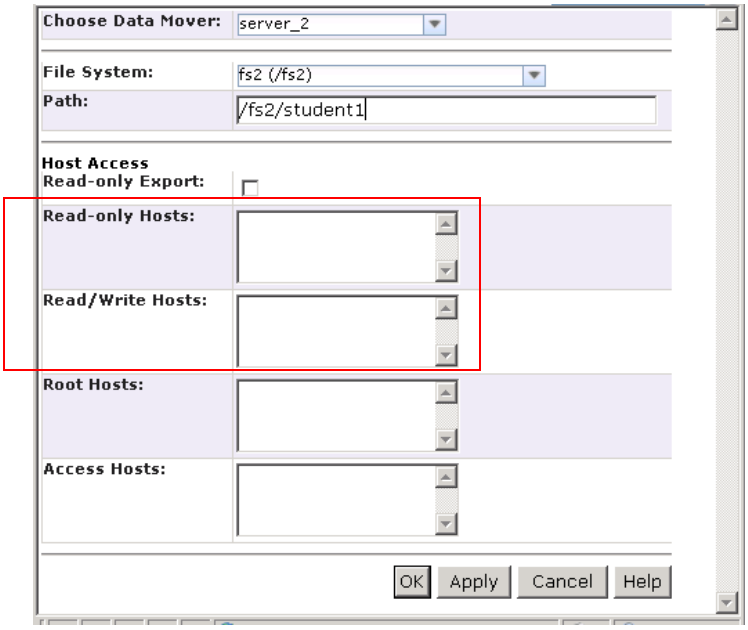
EMC² where information lives®

| Step | Action |
|---|---|
| 2 | **Create and export a file system with root privileges:**<br><br>• Create a **10GB** file system called **fs2** using AVM with the appropriate storage pool-based on the backend storage, as shown here.<br><br>Create From: **Storage Pool**<br>File System Name: **fs2**<br>Storage Pool: **clarsas_r10**<br>Storage Capacity (MB): **10240**<br>Do not select **Automatic Extend Enabled**<br>Verify that **Slice Volumes option** is selected<br>Do not select **File-level Retention Capability**<br>Do not select **Thin Enabled**<br>Do not select **Deduplication Enabled**<br>Data Mover (R/W): **server_2**<br>Mount Point: **Default**<br><br>  <br><br><br>**Note:** By selecting **File Systems**, you see that fs2 has been mounted R/W to server_2. You can verify this by navigating to **Storage > Storage Configuration > File Systems >Mounts** tab.<br><br>• Export **fs2** by navigating to **Storage > Create NFS Export** and entering the following information:<br>Choose data Mover: **server_2**<br>File System: **/fs2**<br>Path: (**no change**)<br>Root Hosts: (**Enter the IP address of YOUR Linux workstation**)<br>• Click **OK**. |



EMC² where information lives®

| Step | Action |
|---|---|
| 3 | **Mount file system:**<br>• Mount **fs2**, which was just exported from server_2 by opening an SSH session using PuTTY to **YOUR** Linux workstation and log in as root. You may also use the student web presentation page to get to the Linux VM host.<br>• Confirm that you are at the root of the workstation's file system.<br>**# cd /**<br>• Create a directory called **/fs2** and mount the file system. /fs2 will be the mountpoint where you will NFS mount the fs2 export you created in the previous step.<br>**# mkdir /fs2**<br>**# mount** *<IP_of_data_mover>*:**/fs2 /fs2**<br>**# df (**Confirm that your export is visible**)**<br>• Change to the **/fs2** directory and create a new directory called **studentX** (where x stands for your team number).<br>**# cd /fs2**<br>**# mkdir studentX**<br>**# chmod 777 studentX**<br>**# cd studentX**<br>**# echo "THIS IS A TEST" >file***x*<br>(Where x is your team number) |
| 4 | **Export and mount fs2 at a sub-directory level:**<br>• Go back to your Unisphere session and export the **fs2** file system at the sub-directory level as shown below:<br>• From the Top Navigation bar, navigate to **Storage > Create NFS Export** (under Common Storage Tasks)<br>Choose data Mover: **server_2**<br>File System: **/fs2**<br>Path: **/fs2/studentX** (Where X is your team number)<br>Read-only Hosts: **OTHER** Linux work station. (See step 1)<br>Read/Write Hosts: **YOUR** Linux workstation. (See step 1)<br>• Click **Ok.** |

| Step | Action |
|---|---|
| |  <br>• Go to **YOUR** Linux work station as root and create a new mountpoint and mount the new exported file system.<br>**# cd /**<br>**# mkdir studentX** (where X is your team number)<br>**# mount** *<IP_of_Data_Mover>*:**/fs2/studentX /studentX** |
| 5 | **Test root privileges:**<br>• Open another PuTTY session to your **OTHER** Linux workstation which is listed in step 1 of this lab. Log in as root.<br>• Create a new directory in the root of the file system on the **OTHER** Linux workstation and name it **remotestudentX** (Where x is your team number).<br>**# cd /**<br>**# mkdir /remotestudent***X*<br>• Mount the above directory to the file system that you exported in the previous step.<br>**# mount** *<IP_Addr_of_Data_Mover>*:**/fs2/studentX /remotestudent***x*<br>**# df (**Confirm that your export is visible**)** |

| Step | Action |
|---|---|
| | • Create a user file in the **/remotestudentX** directory.<br>**# cd /remotestudent*X***<br>**# touch file**<br><br>Do you have write permissions? _____. You should not be able to create a new file because the file system has been export as read only to this particular host.<br><br>• Umount /remotestudentX and exit your SSH session from the **OTHER** Linux workstation.<br><br>**# cd /**<br>**# umount /remotestudentX**<br>**# exit**<br><br>• Back on **YOUR** Linux workstation, create a user file in the studentX directory.<br><br>**# cd /studentX**<br>**# touch newfileX** (Where X is your team number)<br><br>Do you have write permissions? _____. You should be able to create a new file because the file system has been export as read write to this particular host. |
| 6 | **Lab cleanup:**<br><br>• Umount and delete mountpoints and exit from the SSH session to **YOUR** Linux workstation.<br><br>**# cd /**<br>**# umount /studentX** (Where X is your team number )<br>**# rmdir studentX**<br>**# umount /fs2**<br>**# rmdir fs2**<br>**# exit**<br><br>• Go back to your Unisphere window and **delete** the exports for fs2 by navigating to **Storage > Shared Folders > NFS**.<br>• Select both **/fs2** and **/fs2/studentX** exports and click **Delete**.<br>• Next, navigate to the File Systems main pane and **delete fs2**.<br>• Close Unipshere. |

*End of Lab Exercise 7*



EMC² where information lives®

EMC²
where information lives®

EMC²
where information lives®

# Lab Exercise 9: CIFS Implementation

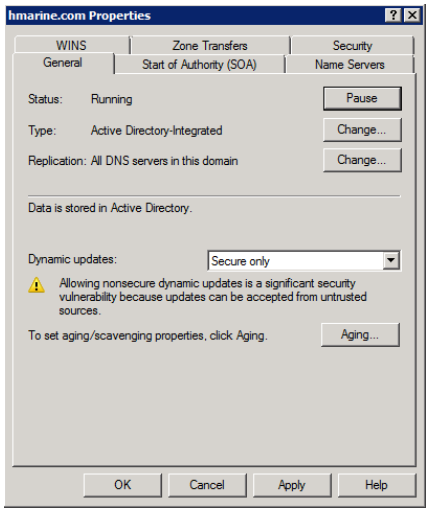
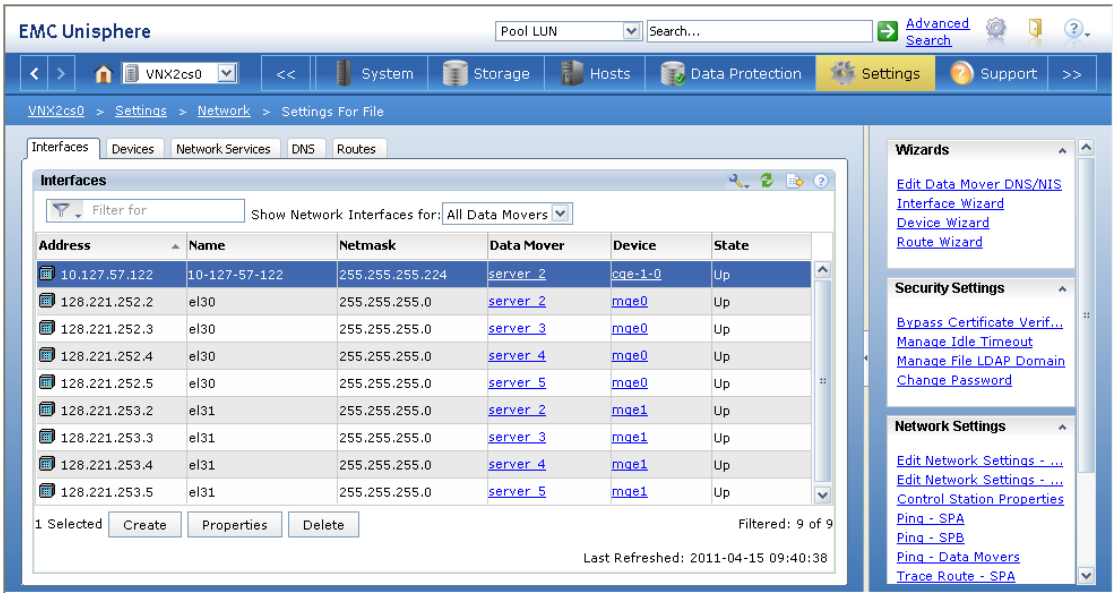
| | |
|---|---|
| **Purpose:** | In this lab, you will configure CIFS on a physical Data Mover. First you will prepare the system for CIFS, then create a CIFS Server on a physical Data Mover and join it to the domain. You will create a top-level administrative share and a lower-level user share and access the shares. The shares and CIFS server will then be removed.<br><br>You will be working with your **WIN-X VM Host** (where **X** is your team number) for this lab. |

| | |
|---|---|
| **Tasks:** | In this lab exercise, you will perform the following tasks:<br>• Prepare the system for CIFS<br>• Create a CIFS Server on a physical Data Mover<br>• Create top-level and lower-level shares<br>• Access the shares from a Windows client<br>• Remove the shares and CIFS Server |



EMC² where information lives®

# Lab 9: Part 1 – Preparing the system for CIFS

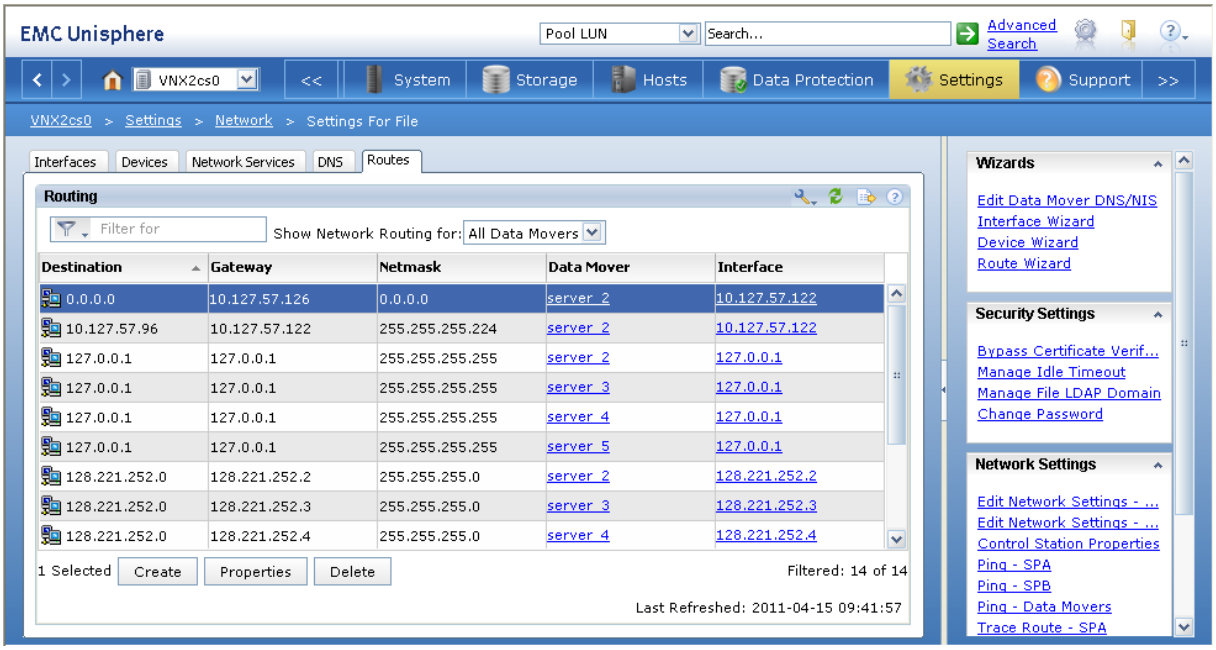
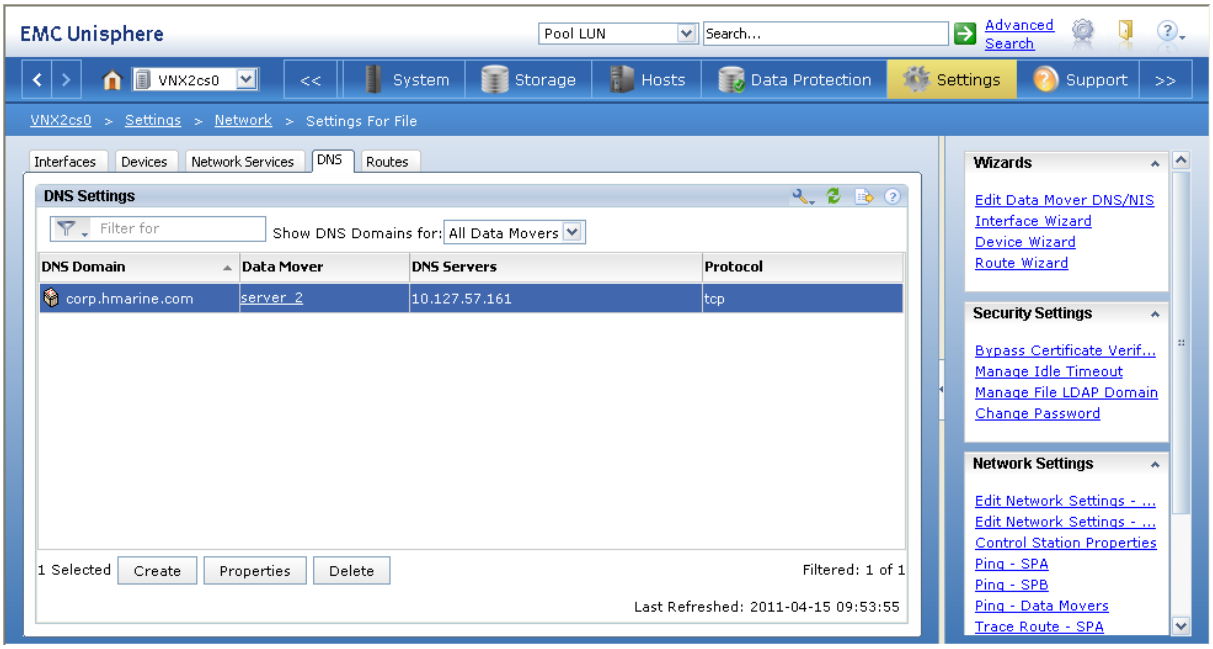
| Step | Action |
|---|---|
| Note | **Preparation:**<br>• The DNS forward lookup zone for hmarine.com has been configured for **Secure only** Dynamic updates as shown here. Your Instructor will be able to show you the screenshot below to verify this configuration.<br>  |
| 2 | **Verify Data Mover interface configuration:**<br>• Log in to Unisphere from your Windows workstation and access your VNX system.<br>• Navigate to **Settings > Network > Settings for File** and click the **Interfaces** tab. Confirm that **server_2** has an interface configured and the **Device** is `cge-1-0`.<br>  |





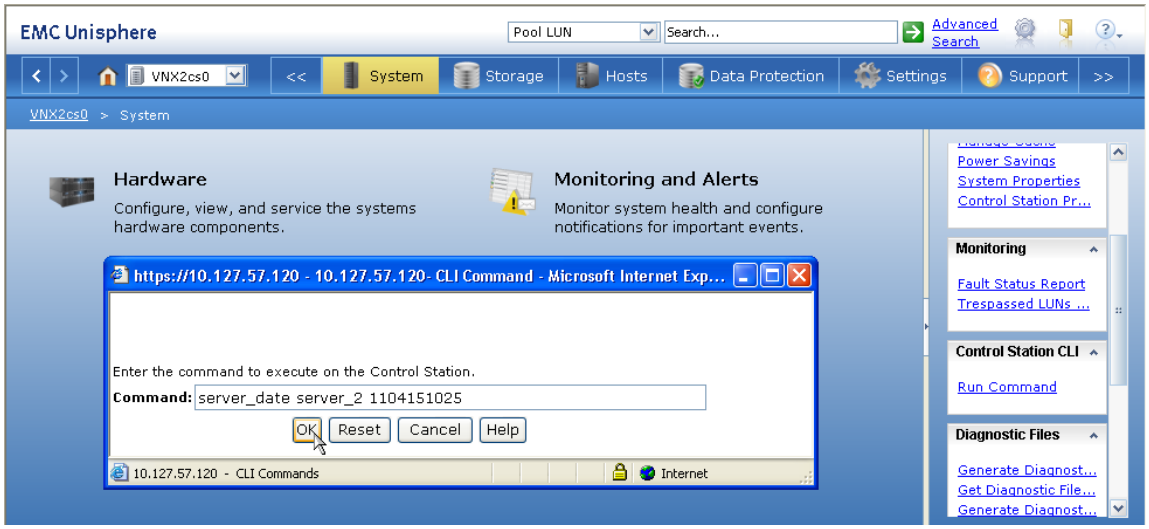


EMC² where information lives®

| Step | Action |
|---|---|
| 3 | **Verify Data Mover default route configuration:**<br>• Click the **Routes** tab and confirm that **server_2** has a default route 0.0.0.0 configured.<br>  |
| 4 | **Verify the Data Mover DNS configuration:**<br>• Click the **DNS** tab. Confirm that **server_2** has DNS configured.<br>  |

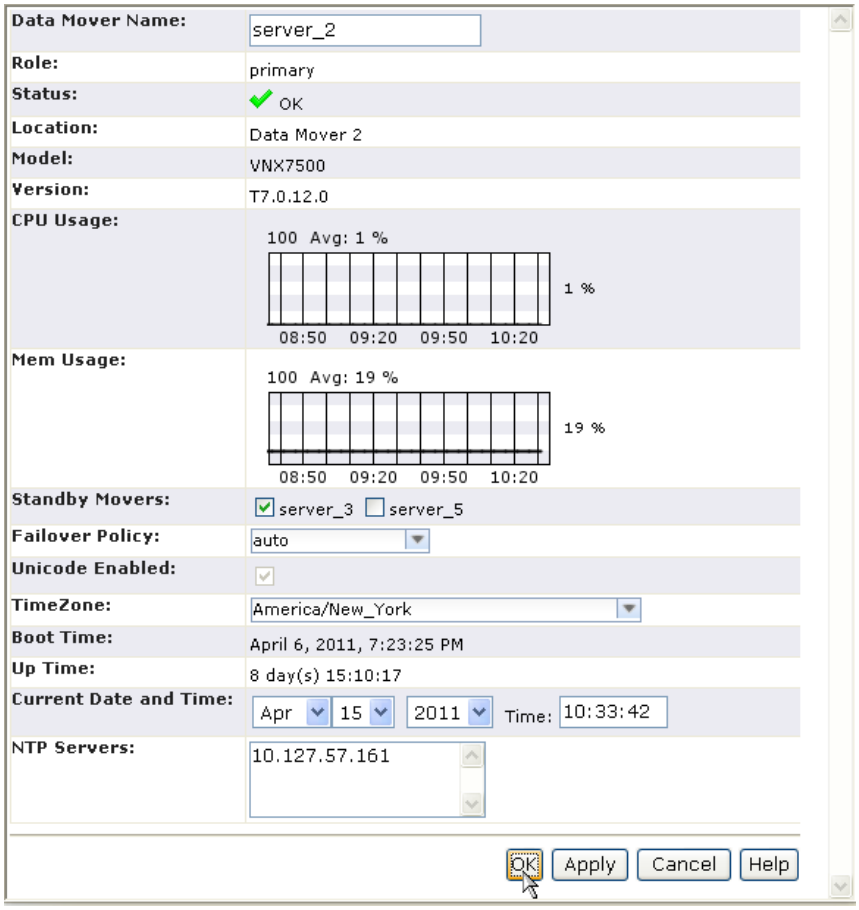


EMC² where information lives®

| Step | Action |
|---|---|
| 5 | **Configure Data Mover time:**<br><br>• Set the time and date of **server_2**.<br>• In Unisphere, click the **Systems tab**. From the **Control Station CLI** task pane section on the right side of the screen, select **Run Command**.<br>• Enter the following command:<br><br>**`server_date server_2`** *YYMMDDHHmm*<br><br>Where:<br>*YY* is the current year<br>*MM* is the current month<br>*DD* is the current date<br>*HH* is the current hour is 24-hour format<br>*mm* is the current minute<br>Example: To set the date and time to April 15, 2011 10:25 AM, type in 24 hour format (military time):<br>**server_date server_2 1104151025**<br><br>• Click **OK, Cancel**<br><br>  |

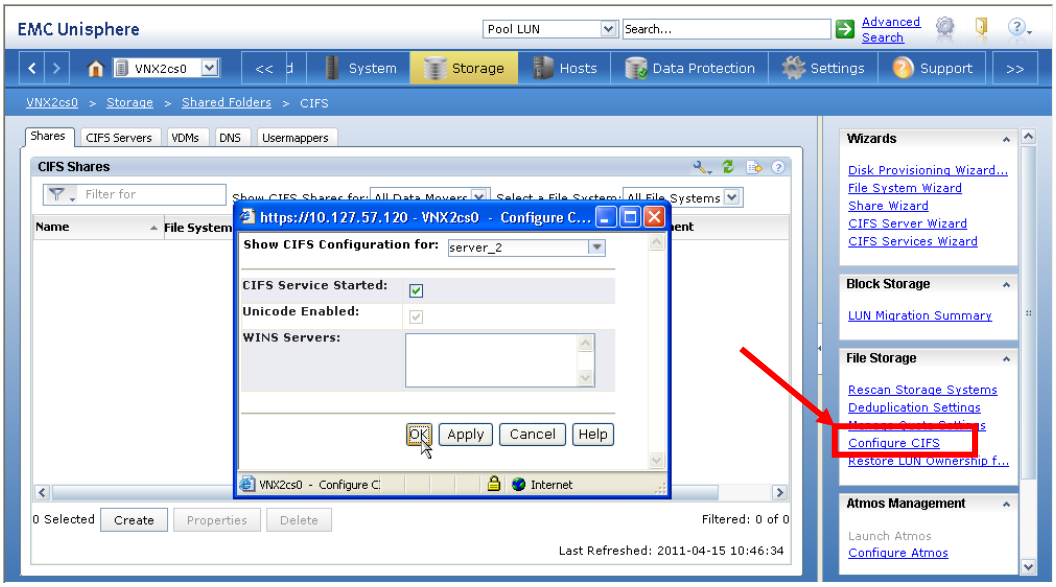


EMC² where information lives®

| Step | Action |
|---|---|
| 6 | **Configure or verify Data Mover for NTP:**<br><br>Having manually set the Data Mover time, now we will configure the Data Mover to use an NTP (Network Time Protocol) server to keep the time synchronized automatically. The HM-1 system is an NTP server.<br><br>• In Unisphere navigate to **System > Hardware > Data Movers**.<br>• Select **server_2** and click **Properties**.<br>• **NTP Servers:** Enter the **NTP** IP address. See Appendix.<br>• Click **OK.**<br><br>  |



EMC² where information lives®

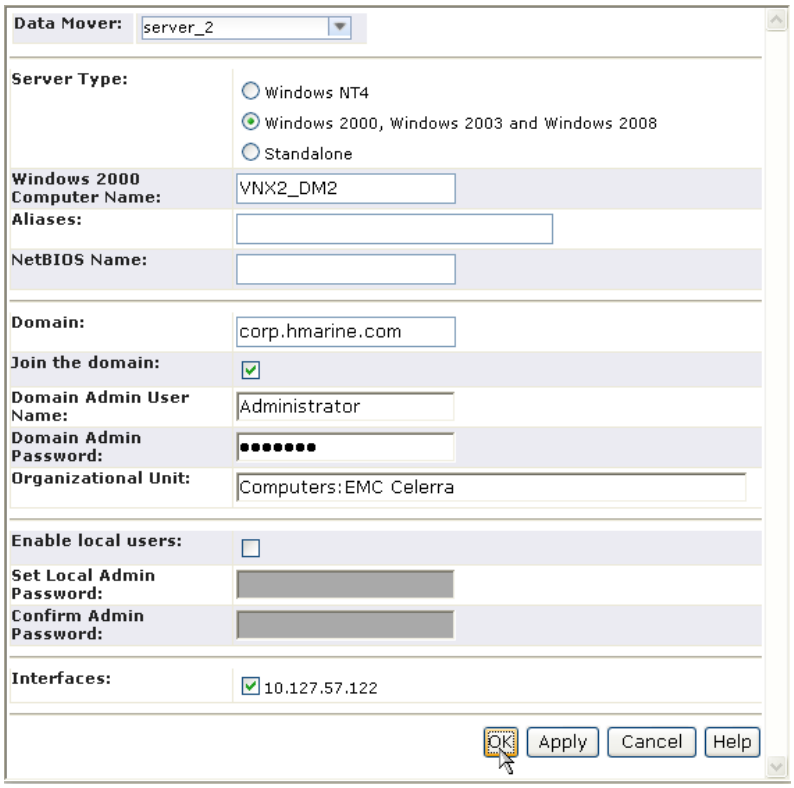
| Step | Action |
|---|---|
| 7 | **Start the CIFS service on the Data Mover:**<br>• Navigate to **Storage > Shared Folders > CIFS**.<br>• From the **File Storage** menu on the right side of the screen select **Configure CIFS**.<br>• In the **Show CIFS Configuration for:** drop down select **server_2**.<br>• Check the **CIFS Service Started** checkbox is checked.<br>• Click **OK.**<br>  |

*End of Lab Exercise 9 Part 1*



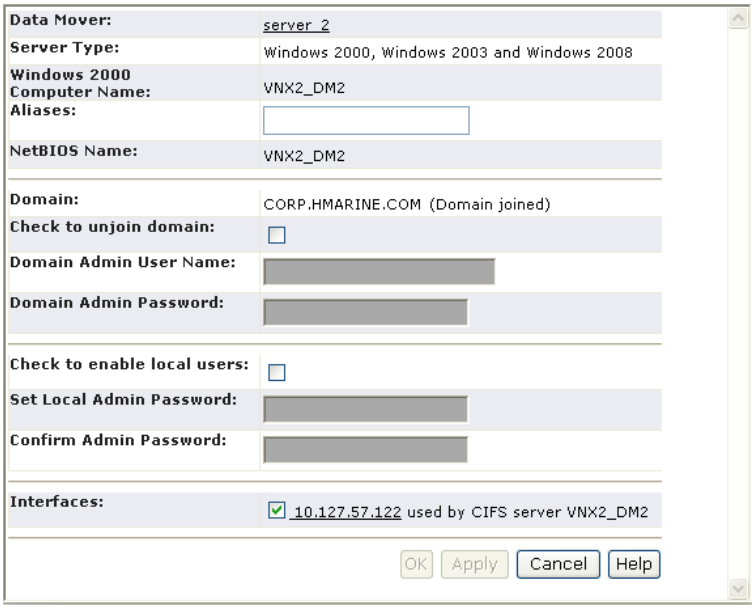
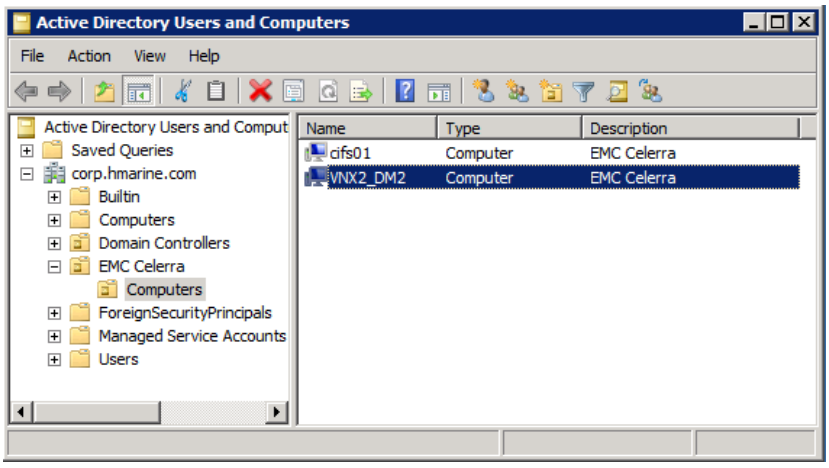
EMC² where information lives®

# Lab 9: Part 2 – Create and Join a CIFS Server

| Step | Action |
|---|---|
| 1 | **Create and join a CIFS Server:**<br><br>• In Unisphere, navigate to **Storage > Shared Folders > CIFS**, select the **CIFS Servers** tab and click **Create**.<br>• Create a CIFS Server with the following information:<br><br>Data Mover: **`server_2`**<br>Server Type: **Windows 2000, Windows 2003, and Windows 2008**<br>Windows 2000 Computer Name: **VNX#_DM2** (Where # means your team number)<br>Aliases and NetBIOS Name: (**Blank**)<br>Domain: **corp.hmarine.com**<br>Join the domain: **Checked**<br>Domain Admin User Name: Administrator<br>Domain Admin Password: adXmin (where X is your subnet address. See Instructor)<br>Enable local users: **Unchecked**<br>Interfaces: **Check the interface you configured earlier for cge-1-0**<br><br>• Click **OK**.<br><br>  |

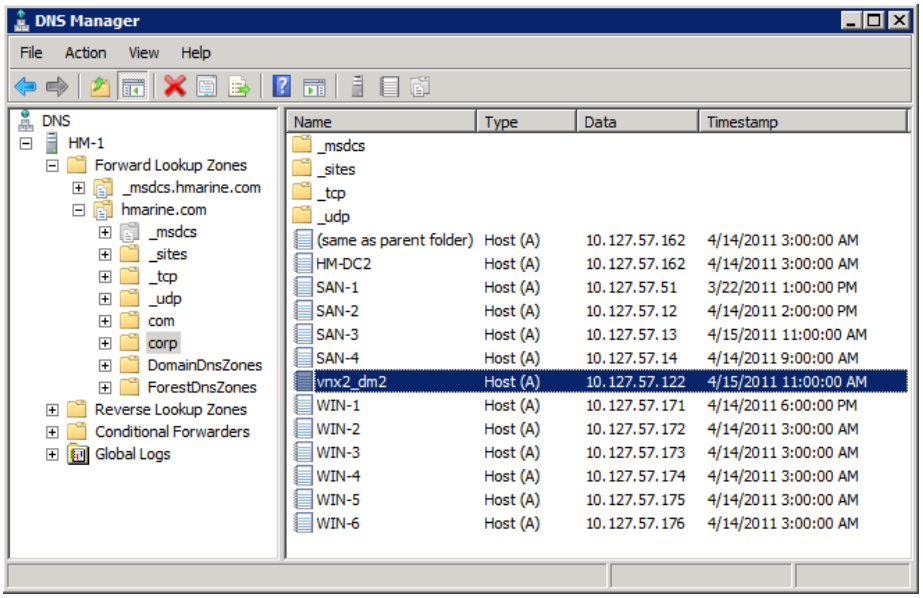


EMC² where information lives®

| Step | Action |
|---|---|
| 2 | **Verify CIFS Server creation:**<br><br>• From the **CIFS Server** window, click the new CIFS Server and select **Properties**.<br>• Notice the **(Domain joined)** near the Domain name.<br>• Click **Cancel.**<br><br>  |
| 3 | **Confirm CIFS Server addition to Active Directory and DNS:**<br><br>• Once you have successfully joined your CIFS server to the domain, your CIFS server name will be displayed in Active Directory Users and Computers folder and in the DNS manager under the corp folder in the hmarine.com forward lookup zone as shown below. Your instructor will be able to verify that your CIFS server has joined the domain by showing you the Active Directory and DNS manager windows<br><br>  |



EMC² where information lives®

| Step | Action |
|---|---|
| |  |

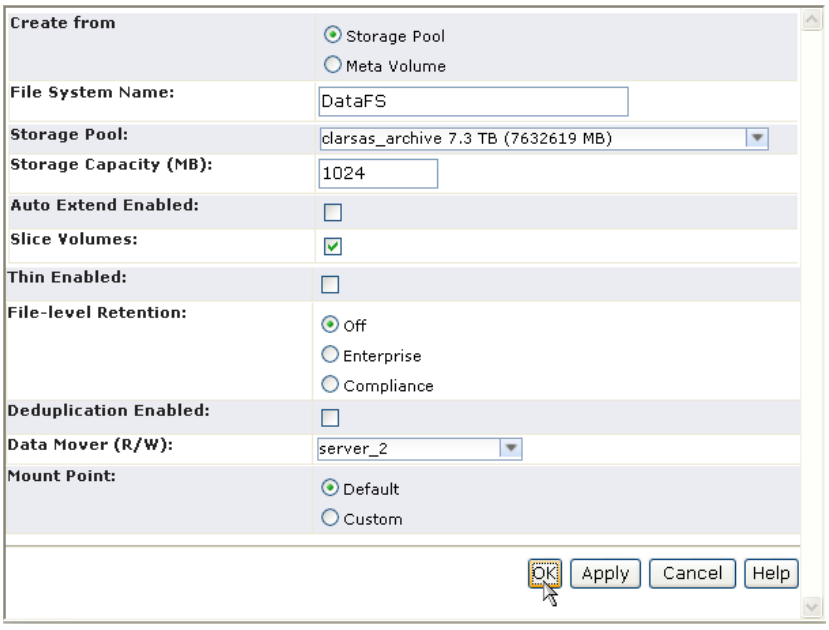


*End of Lab Exercise 9 Part 2*



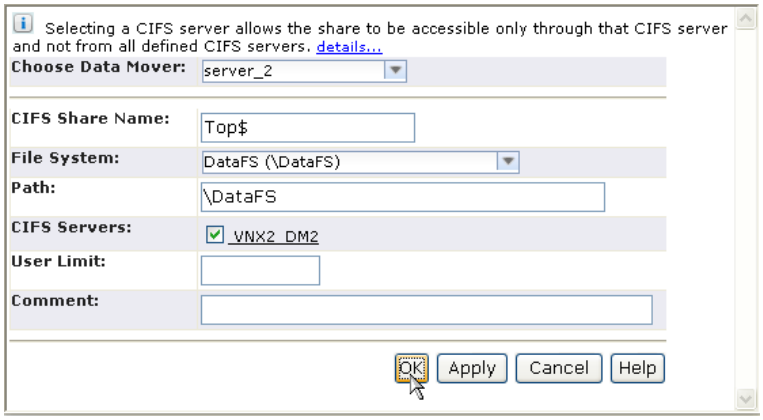
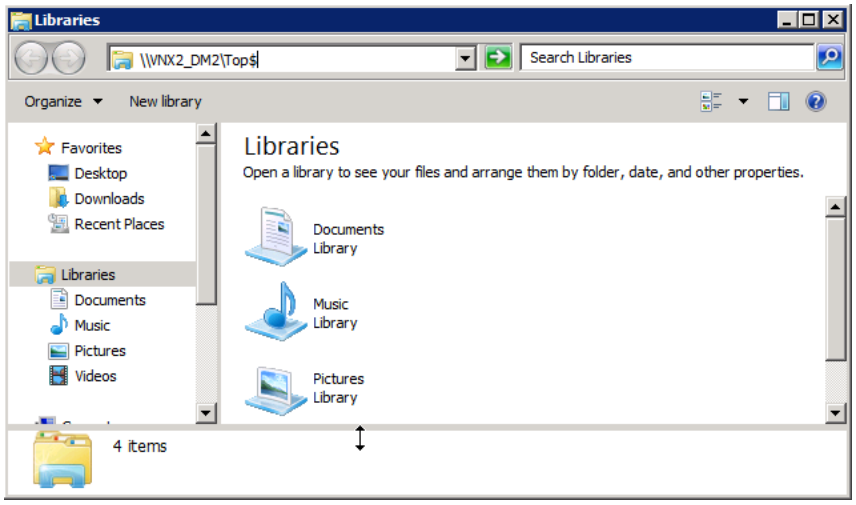
EMC² where information lives®

# Lab 9: Part 3 – Create a CIFS Share

| Step | Action |
|---|---|
| 1 | **Create a file system:**<br><br>• In Unisphere navigate to **Storage > Storage Configuration > File Systems** and select the **File Systems** tab. Click **Create**.<br>• Create a file system with the following information:<br>  • Create From: **Storage Pool**<br>  • File System Name: **DataFS**<br>  • Storage Pool: **Use any available pool**<br>  • Storage Capacity (MB): **1024**<br>  • Auto Extend Enabled: **Unchecked**<br>  • Slice Volumes: **Checked**<br>  • Thin Enabled: **Unchecked**<br>  • File-level Retention: **Off**<br>  • Deduplication Enabled: **Unchecked**<br>  • Data Mover (R/W): **server_2**<br>  • Mount Point: **Default**<br>• Click **OK**.<br><br>  |

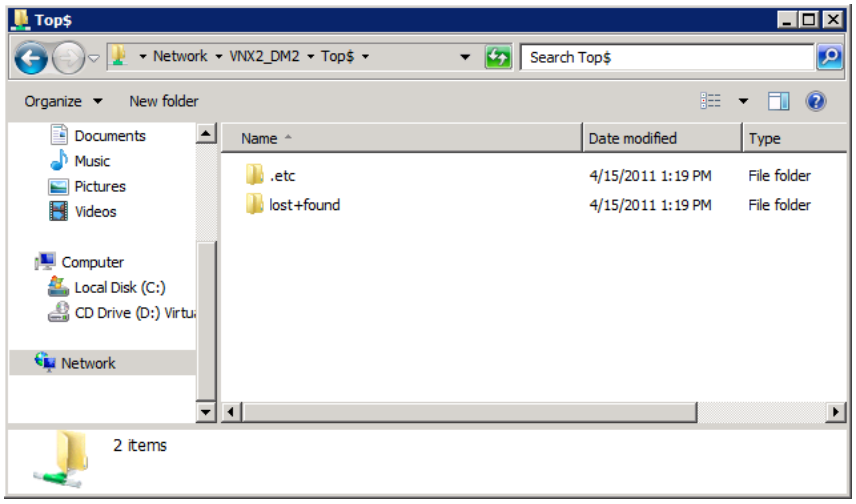


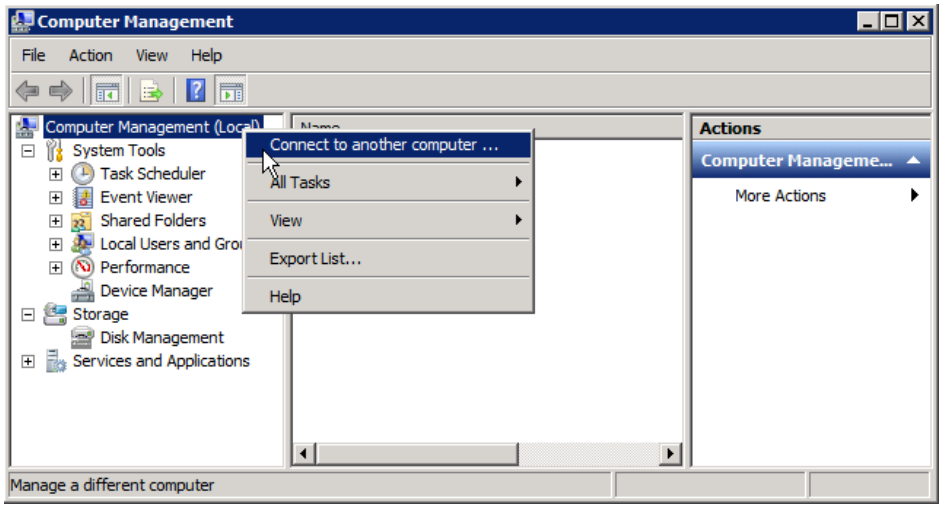
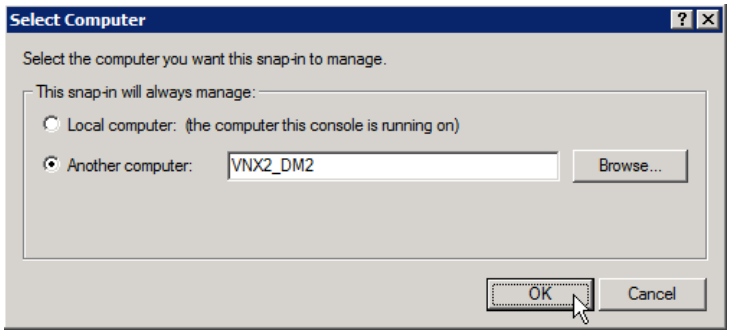
EMC² where information lives®

| Step | Action |
|---|---|
| 2 | **Share the file system for CIFS:**<br><br>• Navigate to **Storage** > **Shared Folders > CIFS** and select the **Shares** tab. Click **Create**.<br>• Create a CIFS Share with the following information:<br><br>  • CIFS Share Name: **Top$**<br>  • File System: **DataFS**<br>  • Path: **\DataFS**<br>  • CIFS Servers: Check **VNX#_DM2** (Where # is your team number)<br><br>• Click **OK**.<br><br>  |
| 3 | **Verify CIFS Share:**<br><br>• On your Windows WIN-X (VM Host) workstation click Start > Administrator. In the navigation field input the following path to the CIFS Share:<br>  • **\\VNX#_DM2\Top$** (where # is your team number)<br>  • **Sign in with:**<br>  • **Username**: Administrator<br>  • **Password**: ad**X**min (where X is the subnet address given to you by your instructor)<br><br>  |



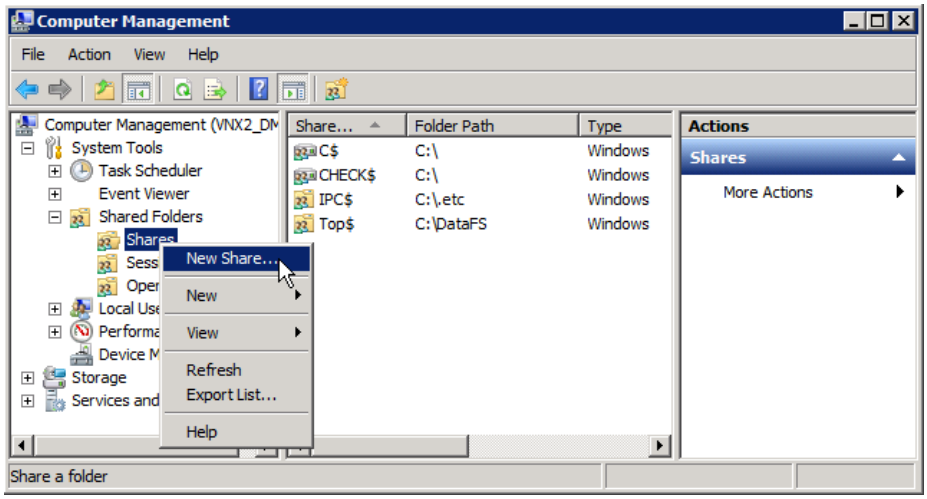
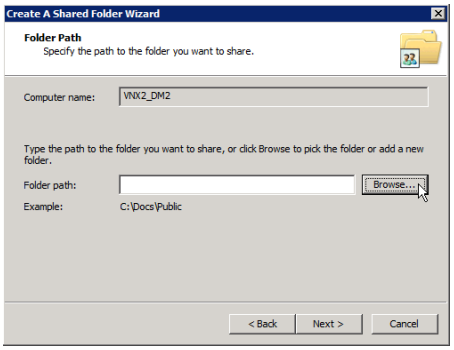
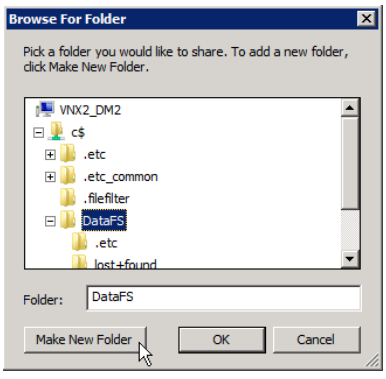
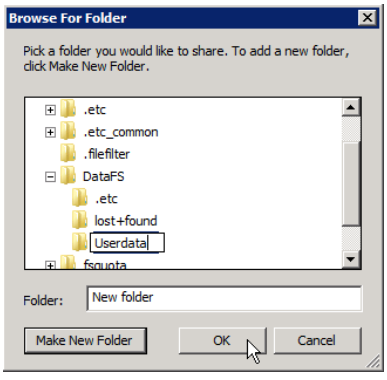
EMC² where information lives®

| Step | Action |
| --- | --- |
| | The share opens to the **.etc** and **lost+found** folders. These folders are at the top-level of all the VNX file systems and should not be disturbed. To prevent inadvertent modifications to these folders by users, it is a best practice to create a lower-level share in the file system for users to access.<br>  |

| Step | Action |
|---|---|
| 4 | **Create a lower-level share:**<br><br>• One way to create lower-level shares is to use the Microsoft Computer Management console. From your team's Windows system launch Computer Management by navigating to **Start > Administrative Tools > Computer Management**.<br>• Right click on **Computer Management (Local)** and select the **Connect to another computer** option.<br><br>  <br><br><br>• In the **Select Computer** dialogue, input the name of your CIFS Server **VNX#_DM2** (where # is your team number). Click OK.<br><br>  <br> |



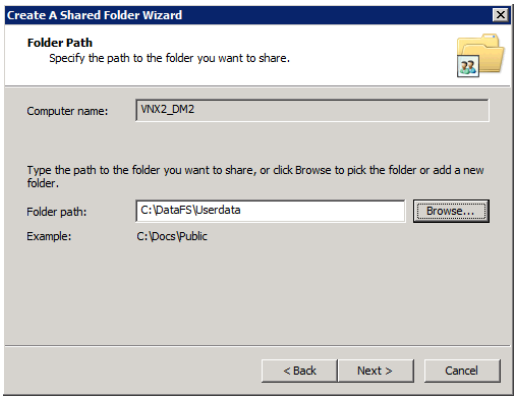
EMC² where information lives®

| Step | Action |
|---|---|
| | • Now we are in the Computer Management window for VNX#_DM2. On the left side tree expand **System Tools** and **Shared Folders** containers. Right-click **Shares** and select the **New Share** option.<br>  |
| 5 | **Create a Shared Folder Wizard:**<br>• Read the Welcome screen and click **Next**.<br> <br>  <br>• From the **Folder Path** window click **Browse** and select the **DataFS** folder. Click **Make New Folder** and create a new folder named **Userdata**. Click **OK** to create the folder. Click **Next**.<br>  <br>  |

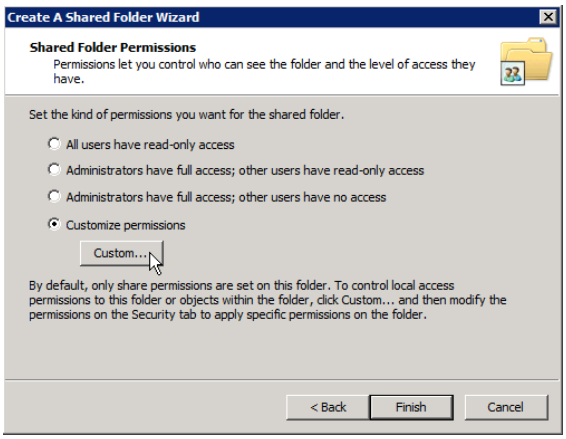


EMC² where information lives®

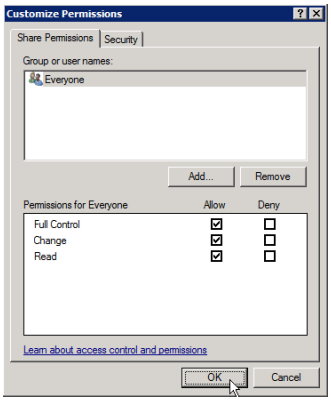
| Step | Action |
|---|---|
| | • The folder path of **C:\DataFS\Userdata** should be displayed in the screen, click **Next**. |

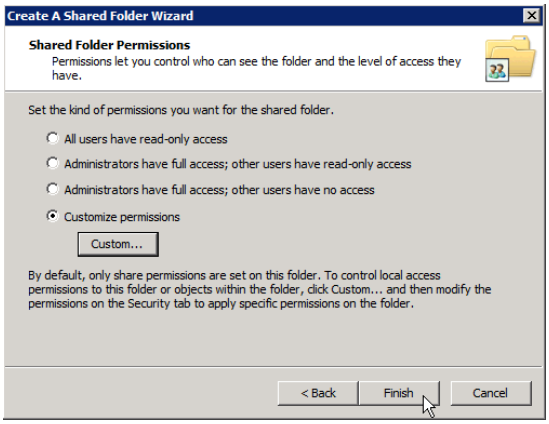
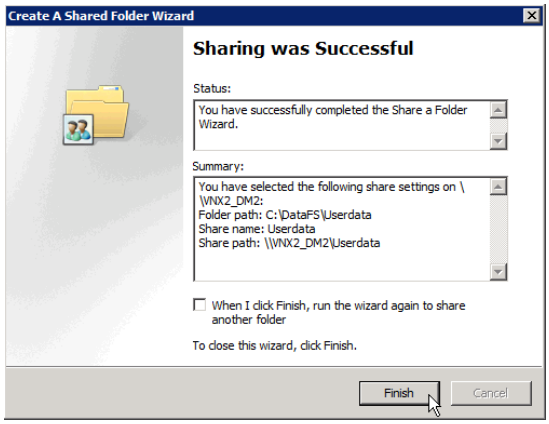
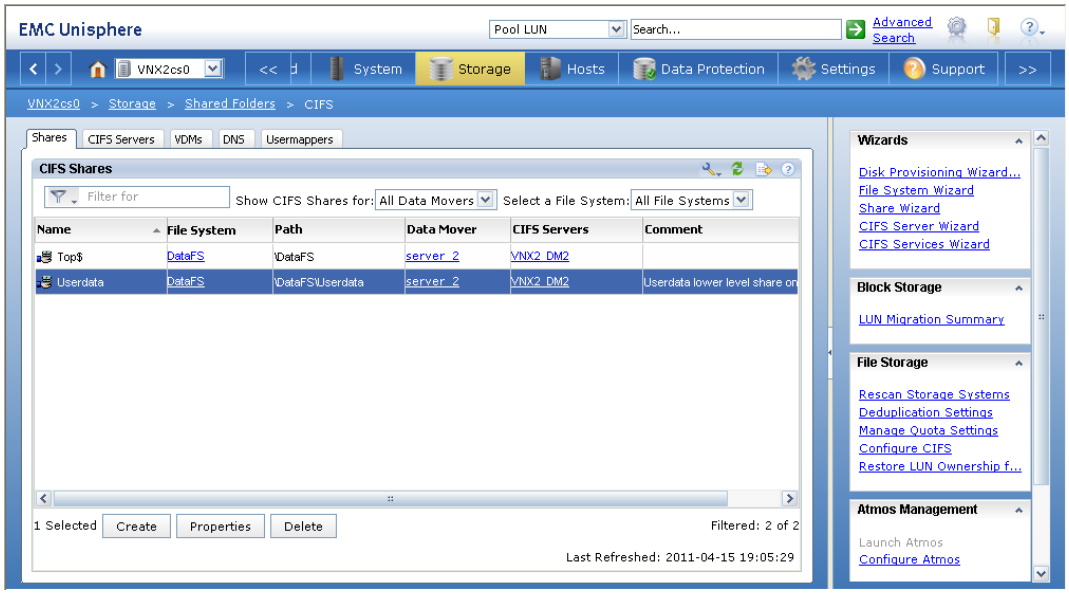

Create A Shared Folder Wizard
Folder Path
Specify the path to the folder you want to share.
Computer name:
VNX2_DM2
Type the path to the folder you want to share, or click Browse to pick the folder or add a new folder.
Folder path:
C:\DataFS\Userdata
Browse...
Example:
C:\Docs\Public
< Back
Next >
Cancel

- From the **Name, Description**, and **Settings** window keep the defaults and click **Next**.
- The next wizard screen is for defining permissions to the share. There are several pre-configured options available. Select the **Customize permissions** option and click **Custom**.


Create A Shared Folder Wizard
Shared Folder Permissions
Permissions let you control who can see the folder and the level of access they have.
Set the kind of permissions you want for the shared folder.
All users have read-only access
Administrators have full access; other users have read-only access
Administrators have full access; other users have no access
Customize permissions
Custom...
By default, only share permissions are set on this folder. To control local access permissions to this folder or objects within the folder, click Custom... and then modify the permissions on the Security tab to apply specific permissions on the folder.
< Back
Finish
Cancel

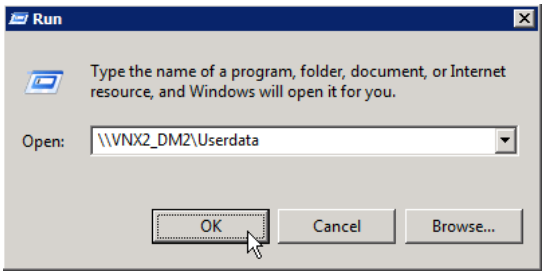
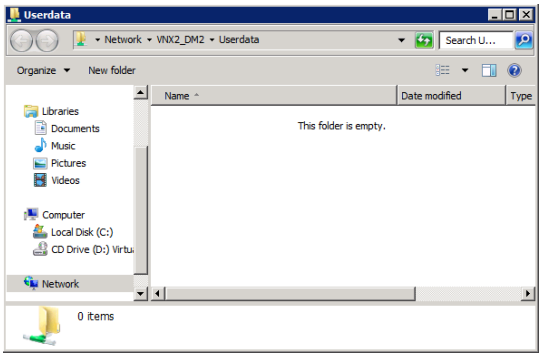
- In the **Customize Permissions** dialoge check the **Full Control** checkbox in the **Allow** column which will cause the remaining **Allow** checkboxes to be checked, then click **OK**.



| Step | Action |
|---|---|
| | • With the custom permissions now set, click **Finish**.<br>• The final wizard screen presents a summary of the newly created share. Click **Finish** to close the wizard.<br>  <br>  |
| 6 | **Verify if the low-level share has been created:**<br>• In Unisphere, navigate to **Storage > Shared Folders > CIFS** and click the **Shares** tab. The new **Userdata** share should be listed.<br>  |

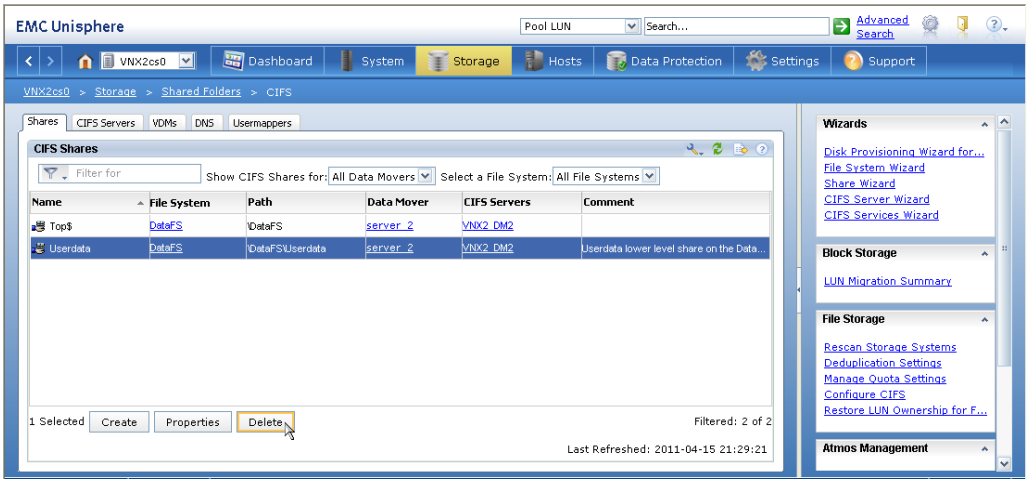
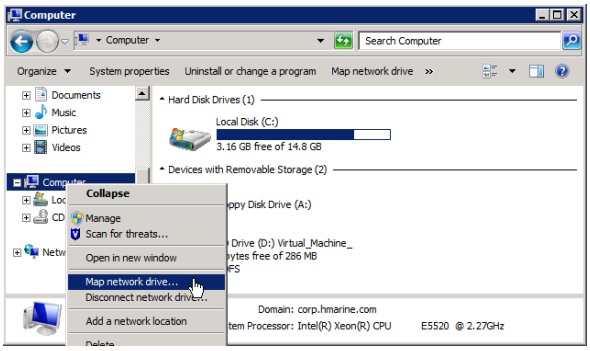
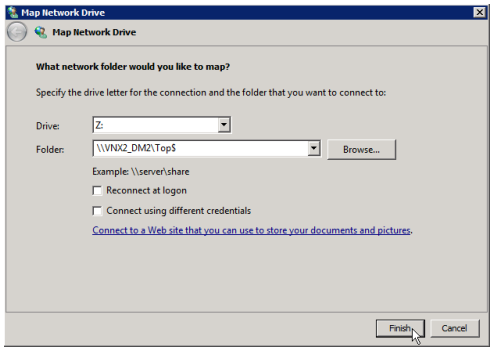


EMC² where information lives®

| Step | Action |
|---|---|
| | • On your team's Windows workstation, log off and log back in. Select **Other User** and sign in as username: **corp\swong** password: **password** (refer to your Appendix).<br> <br>• Once logged in, navigate to **Start > Run** and enter the following path to the **Userdata** share: **\\VNX#_DM2\Userdata** (where # is your team number)<br>• Click **OK**.<br>  <br>Notice the share does not contain the **.etc** and **lost+found** folders that were present at the top-level share.<br>  |

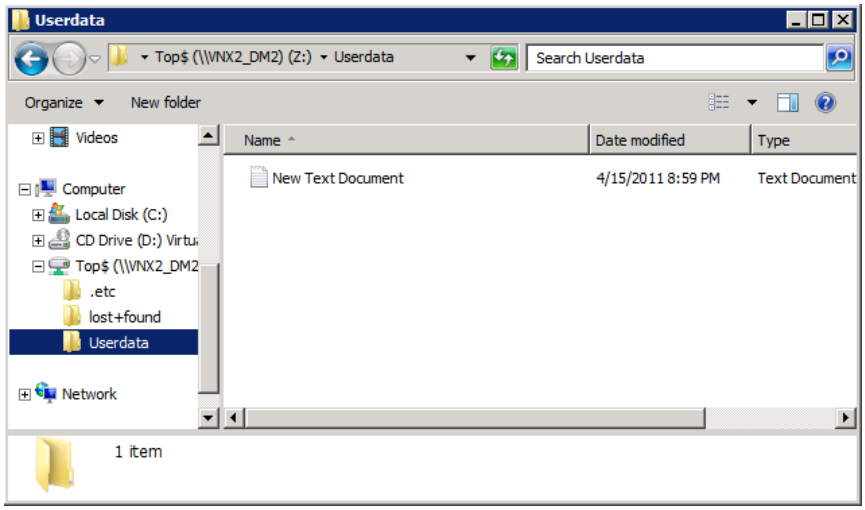


EMC² where information lives®

| Step | Action |
|---|---|
| 7 | **Deleting a low-level share:**<br><br>• Create a new text document by right-clicking in the open space and selecting **New > Text Document.** Name it **New Text Document**.<br>• Open the new document and input some text, then close and save the file.<br>• Logoff your Windows workstation. Log back into your Windows workstation, click **Other User** and sign in as the Administrator.<br>• Login to Unisphere, select your VNX from the All Systems dropdown list and navigate to the **Storage > Shared Folders > CIFS** and click the **Shares** tab.<br>• Select the **Userdata** share and click **Delete, OK.**<br><br>  <br><br>When a CIFS Share is deleted, the directory and file structure for the share is ***not removed***, only the sharing element is removed.<br><br>• On your Windows workstation click **Start**, right-click **Compute**r and select **Map network drive.**<br>• In the **Map Network Drive** dialoge, in the **Folder** field input the path **\\VNX#_DM2\Top$** and uncheck the **Reconnect at logon** option. Click **Finish**.<br>• A login screen will appear. Use the following credentials:<br>  ○ Username: Administrator<br>  ○ Password: ad**X**min (where X is the subnet address given to you by your instructor)<br><br>  <br>  |



EMC² where information lives®

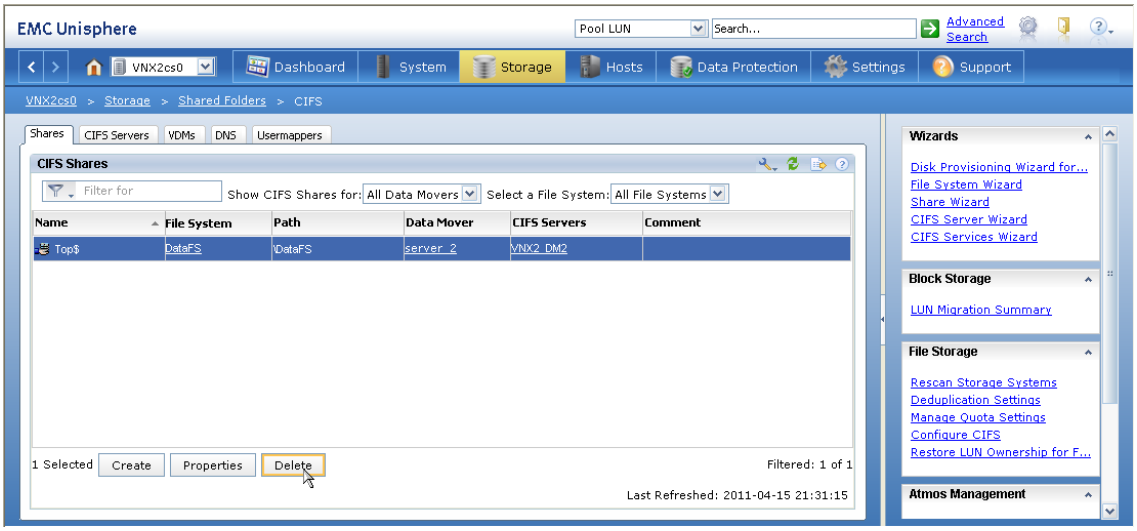
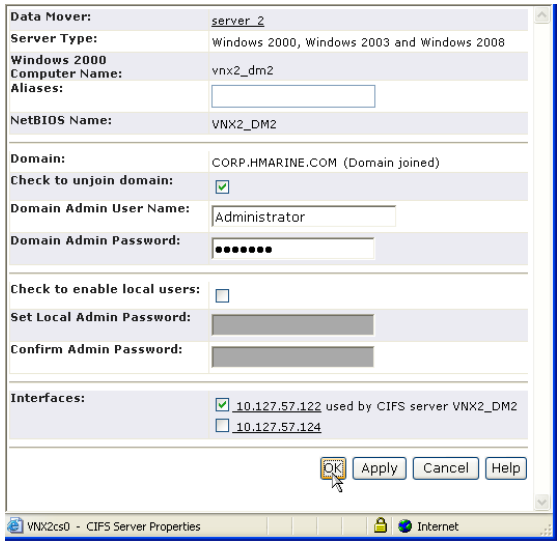
| Step | Action |
|---|---|
| | The share opens as a mapped drive letter in Windows Explorer. The Userdata folder and the text document created earlier are still present.<br>  |

*End of Lab Exercise 9 Part 3*



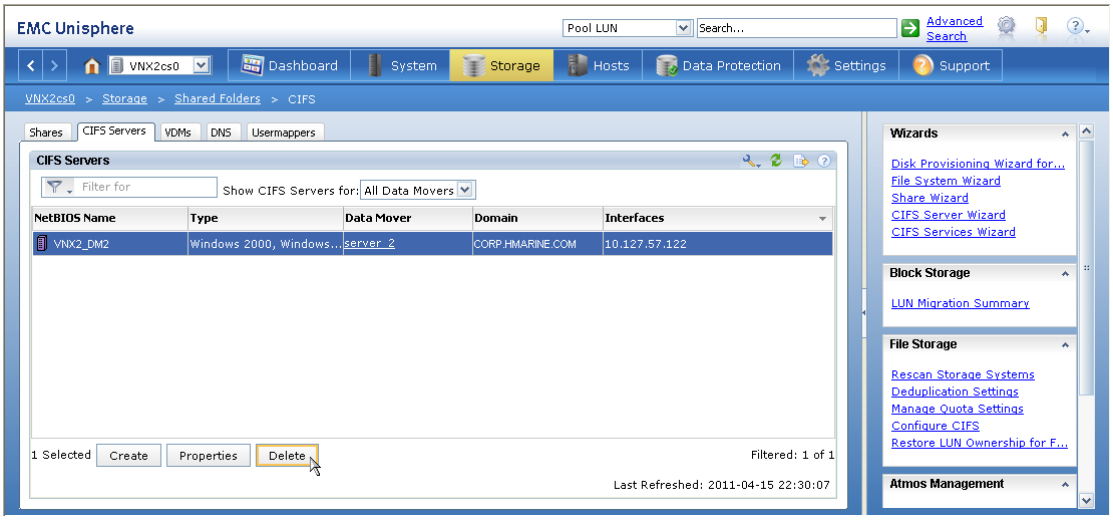
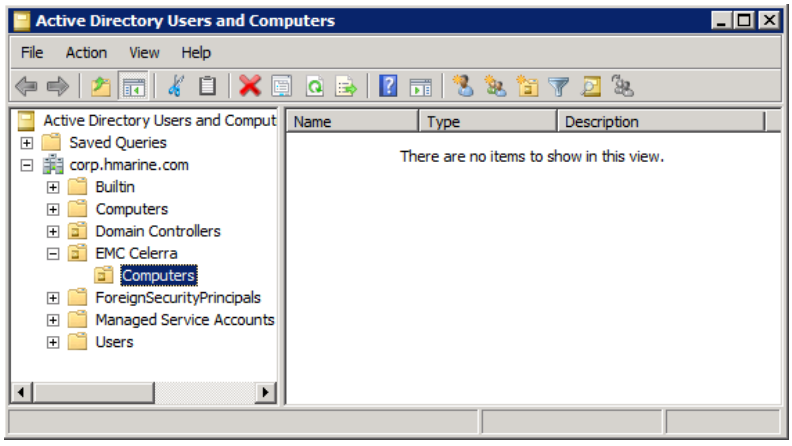
EMC² where information lives®

# Lab 9: Part 4 – Deleting a CIFS Server

| Step | Action |
|---|---|
| 1 | **Delete share associated with CIFS server:**<br><br>• In Unisphere navigate to **Storage > Shared Folders > CIFS** and click the **Share** tab.<br>• Select the **Top$** share and click **Delete**, **OK**.<br><br>  |
| 2 | **Unjoin CIFS Server from the Domain:**<br><br>• Click the **CIFS Servers** tab, select the **VNX#_DM2** (where # is your team number) CIFS Server and select **Properties**.<br>• Check the **Check to unjoin the domain** and input the **Domain Admin User Name** (Administrator) and the **Domain Admin Password** (adXmin).<br>• Click **OK** to remove the CIFS Server from the domain.<br><br>  |

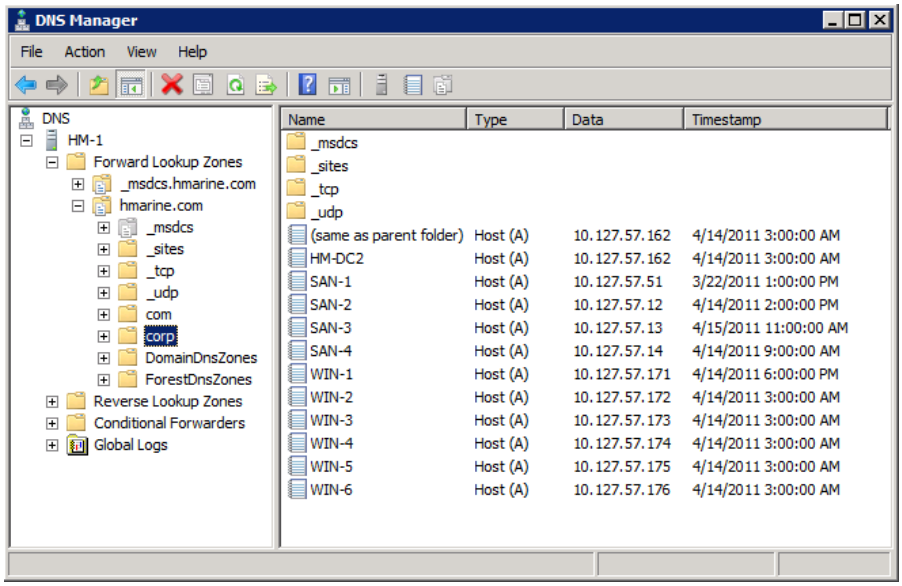
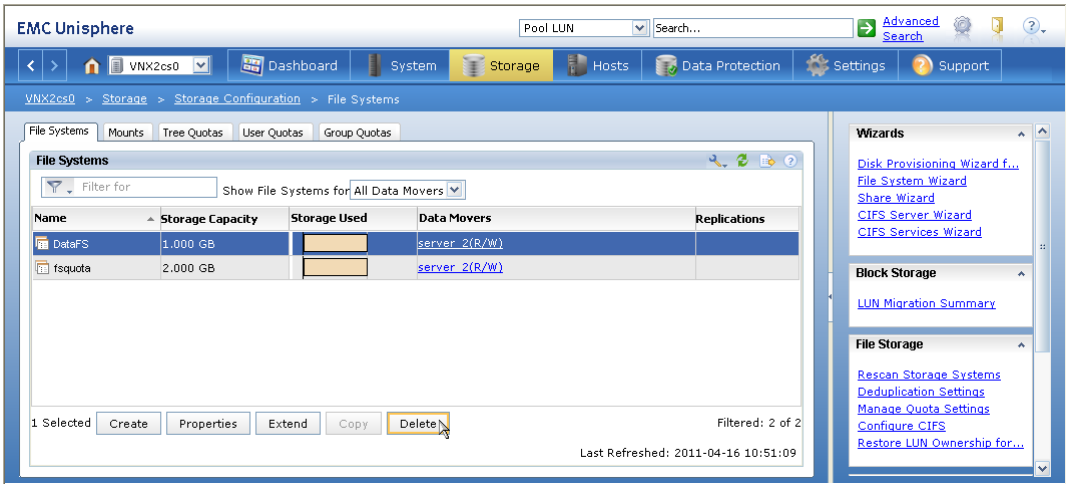


EMC² where information lives®

| Step | Action |
|---|---|
| 3 | **Delete CIFS server:**<br><br>• To delete the CIFS Server, from the **CIFS Servers** tab select the CIFS Server **VNX#_DM2** (where # is your team number) and click **Delete**, **OK**.<br><br>  |
| 4 | **Verify CIFS server deletion:**<br><br>• Working with your instructor, verify the new CIFS Server has been removed from the Active Directory OU container **EMC Celerra**.<br><br>  |



EMC² where information lives®

| Step | Action |
|---|---|
| | • Working with your instructor, verify that the CIFS Server has been removed from Dynamic DNS.<br>  |
| 5 | **Delete DataFS file system:**<br>• In Unisphere, navigate to **Storage > Storage Configuration > File Systems**.<br>• From the **File Systems** tab, select the **DataFS** file system and click **Delete, OK**.<br>  |

*End of Lab Exercise 9*



EMC² where information lives®

# Lab Exercise 10: Implementing File System Quotas

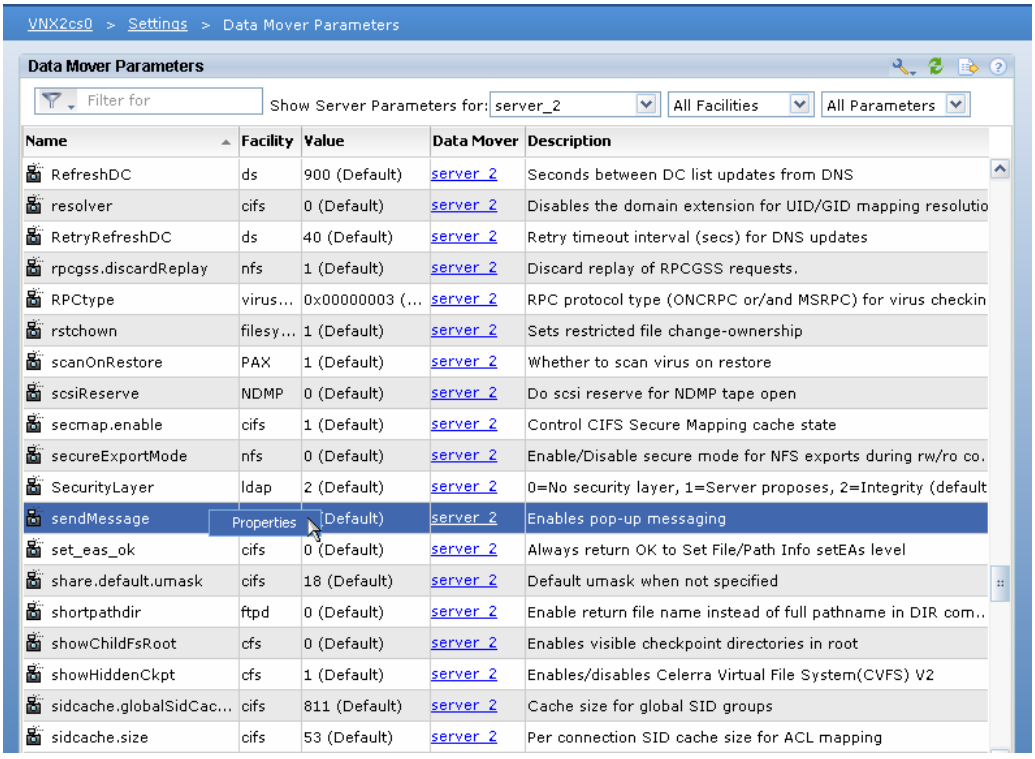
| | |
|---|---|
| **Purpose:** | To configure quota limitations for a VNX file system using the Windows interface and EMC Unisphere.<br><br>You will be working with your **WIN-X VM Host** and **Linux-X VM Host** (where **X** is your team number) for this lab. |

| | |
|---|---|
| **Tasks:** | In this lab exercise, you will perform the following tasks:<br><br>• Configure hard and soft quotas on the VNX system<br>• Enable Quota management from the Windows GUI<br>• Test the effects of the quota limits on the CIFS share<br>• Visualize the Quota Log Entries from the Windows system<br>• Visualize Quota reports from LINUX clients |



EMC² where information lives®

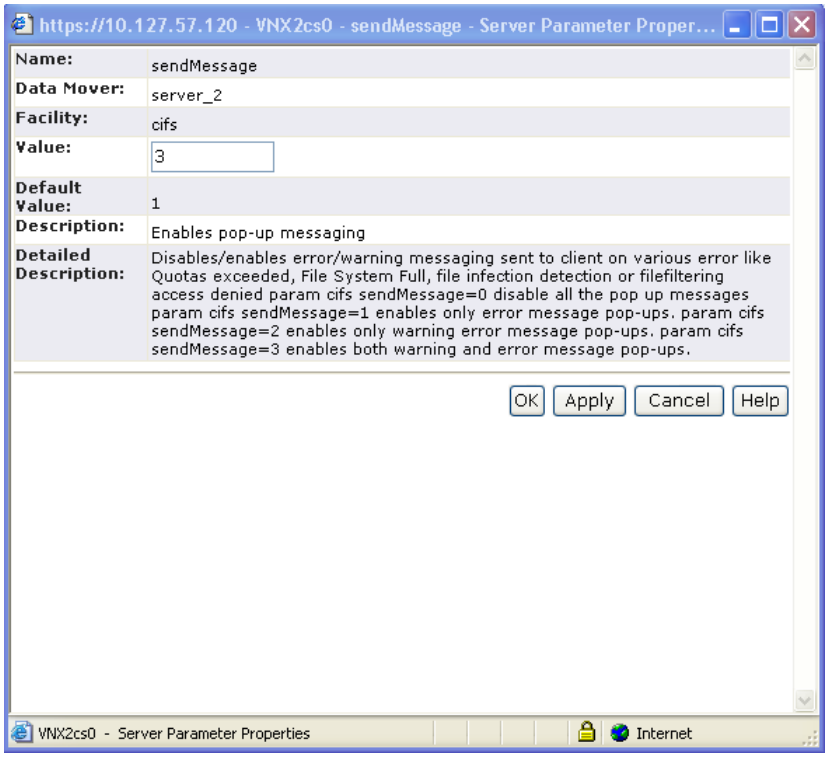
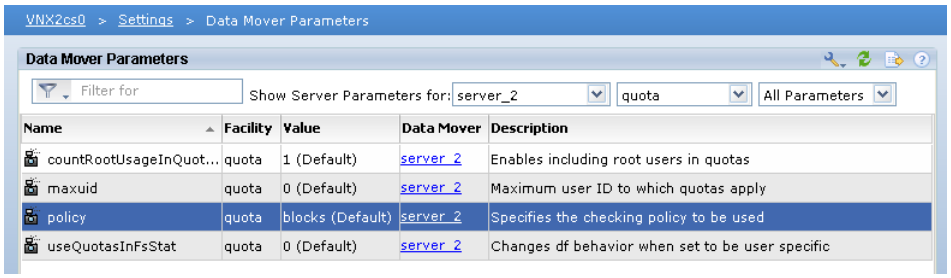
# Lab 10: Part 1 – Configuring Quotas using the Windows & Unisphere

| Step | Action |
|---|---|
| 1 | **Modify Data Mover default configuration for consistency between the VNX and the Windows Properties quota information:**<br><br>• Login to Unisphere from your team's Windows workstation and select your VNX system.<br>• From the Top Navigation bar, navigate to **Settings > Data Mover Parameters**.<br>• Select for the Show server Parameters: field, **server_2** , **All Facilities**, and **All Parameters** as shown in the screen capture.<br>• Scroll down in the list until you find the **sendMessage** parameter listed in the name column.<br>• Right-click this parameter and from the drop-down menu, select **Properties**.<br><br>Notice the default value is 1.<br><br>  |

VNX2cs0 > Settings > Data Mover Parameters
Data Mover Parameters
Filter for
Show Server Parameters for: server_2
All Facilities
All Parameters
Name
Facility
Value
Data Mover
Description
RefreshDC ds 900 (Default) server_2 Seconds between DC list updates from DNS
resolver cifs 0 (Default) server_2 Disables the domain extension for UID/GID mapping resolutio
RetryRefreshDC ds 40 (Default) server_2 Retry timeout interval (secs) for DNS updates
rpcgss.discardReplay nfs 1 (Default) server_2 Discard replay of RPCGSS requests.
RPCtype virus... 0x00000003 (... server_2 RPC protocol type (ONCRPC or/and MSRPC) for virus checkin
rstchown filesy... 1 (Default) server_2 Sets restricted file change-ownership
scanOnRestore PAX 1 (Default) server_2 Whether to scan virus on restore
scsiReserve NDMP 0 (Default) server_2 Do scsi reserve for NDMP tape open
secmap.enable cifs 1 (Default) server_2 Control CIFS Secure Mapping cache state
secureExportMode nfs 0 (Default) server_2 Enable/Disable secure mode for NFS exports during rw/ro co.
SecurityLayer ldap 2 (Default) server_2 0=No security layer, 1=Server proposes, 2=Integrity (default
sendMessage Properties Default) server_2 Enables pop-up messaging
set_eas_ok cifs 0 (Default) server_2 Always return OK to Set File/Path Info setEAs level
share.default.umask cifs 18 (Default) server_2 Default umask when not specified
shortpathdir ftpd 0 (Default) server_2 Enable return file name instead of full pathname in DIR com..
showChildFsRoot cfs 0 (Default) server_2 Enables visible checkpoint directories in root
showHiddenCkpt cfs 1 (Default) server_2 Enables/disables Celerra Virtual File System(CVFS) V2
sidcache.globalSidCac... cifs 811 (Default) server_2 Cache size for global SID groups
sidcache.size cifs 53 (Default) server_2 Per connection SID cache size for ACL mapping

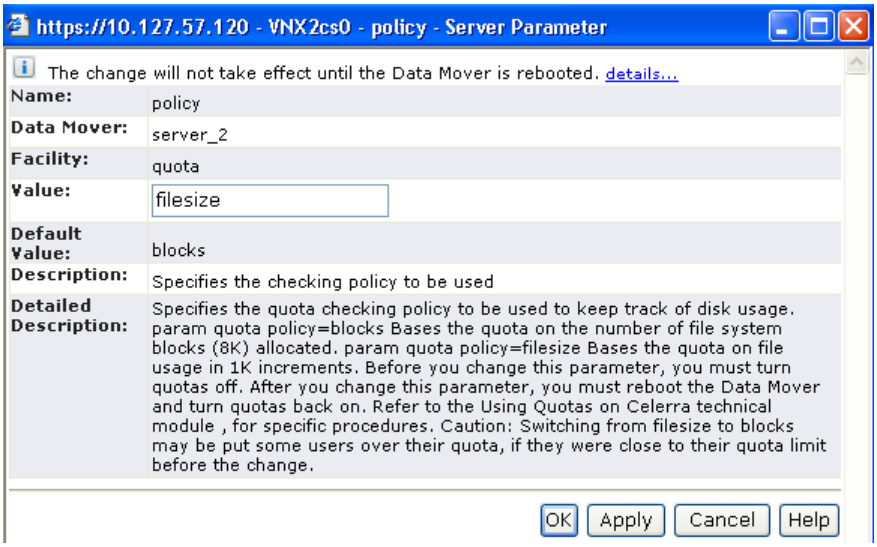
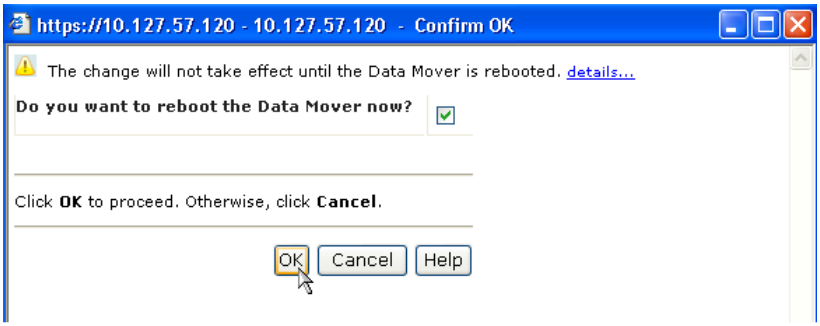


EMC² where information lives®

| Step | Action |
|---|---|
| | • Change this entry to **3**, if not already 3, and click **OK** at the bottom of the window.<br>  <br><br>**Note:** This command enables both Quota Error and Warning pop-up messages for Windows client**.** |
| 2 | **Modify quota policy:**<br>• Next, for the Show server Parameters: field, select **server_2**, **Quotas**, and **All Parameters**.<br>• Scroll down in the list until you find the **policy** parameter listed in the name column.<br>• Right-click the parameter and **Properties**. Notice the default value is block.<br>  <br> |

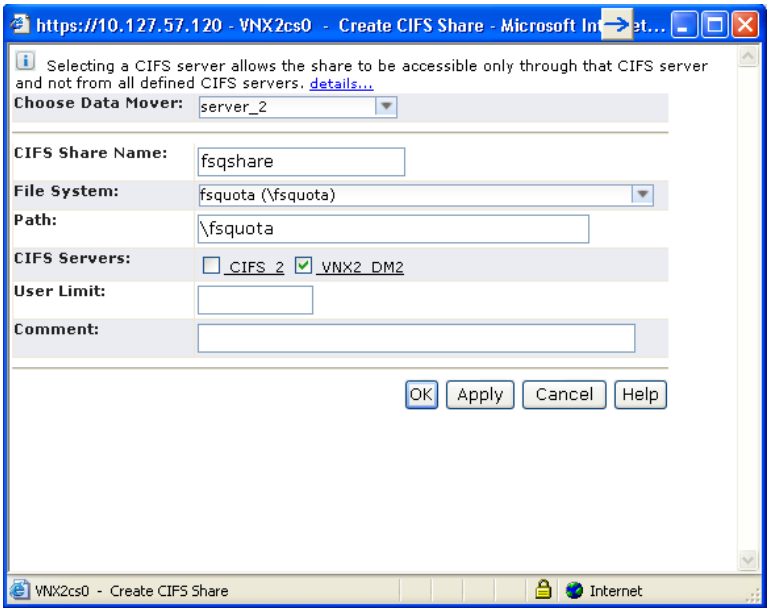
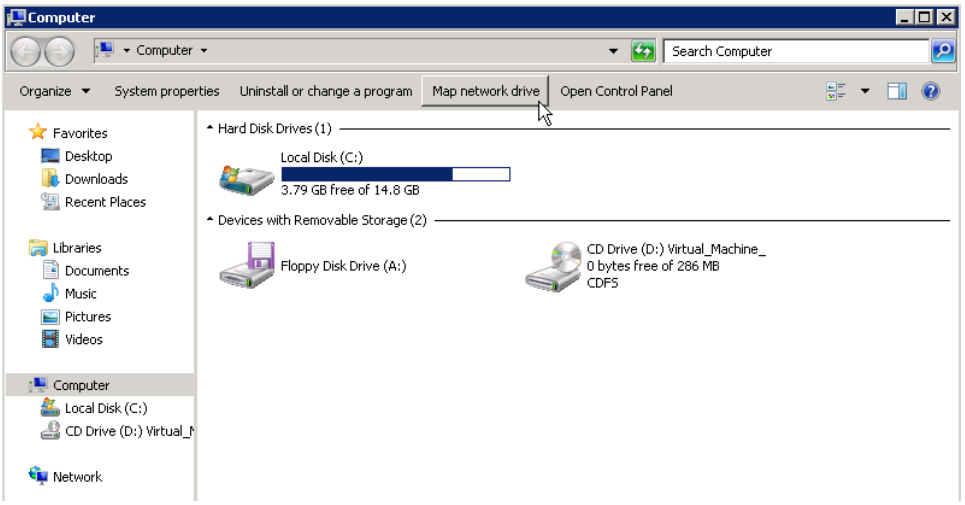


EMC² where information lives®

| Step | Action |
|---|---|
| | • Change this entry to ***filesize***, if not already *filesize*, and click **OK** at the bottom of the window.<br><br>**Note:** This command changes how the Data Mover counts quota usage (from 8KB to 1KB). The default value "block" is not recommended when quotas will be managed in the Windows environment.<br><br>  <br><br><br>• Check the **reboot box** for the changes to take effect and Click **OK** as shown in the image.<br><br>  <br> |
| 3 | **Create a file system:**<br><br>• Once server_2 has rebooted, create a 2 GB (**2048 MB**) file system on **server_2** named **fsquota**. Use the **clarsas_r10** storage pool. Keep all default values. |
| 4 | **Create a network interface:**<br><br>• On your team's server_2, create an IP interface for cge1-0 using the Appendix for the IP address (refer to the Network Configuration lab exercise if you need help.) |
| 5 | **Create and Join a CIFS Server:**<br><br>• Create a CIFS server called **VNX#_DM2** on server_2 (Where # means your team number) and join it to the Windows Domain (refer to the Configuring CIFS lab exercise if you need help.) |

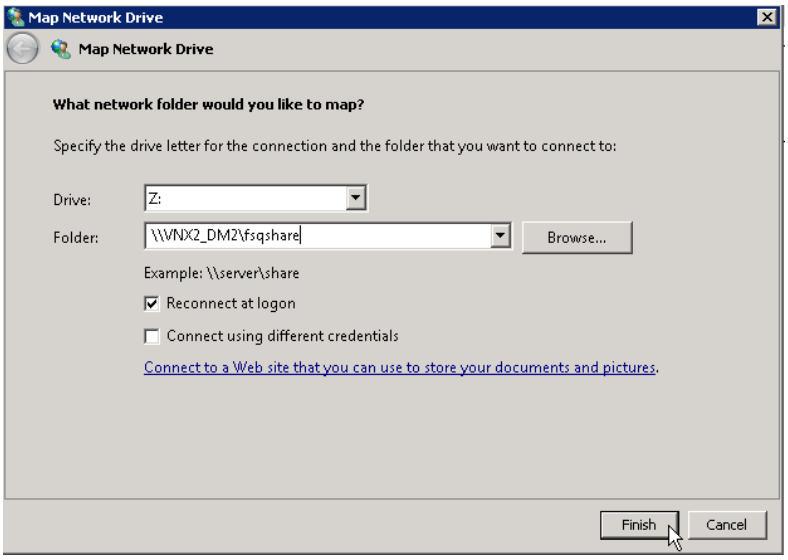
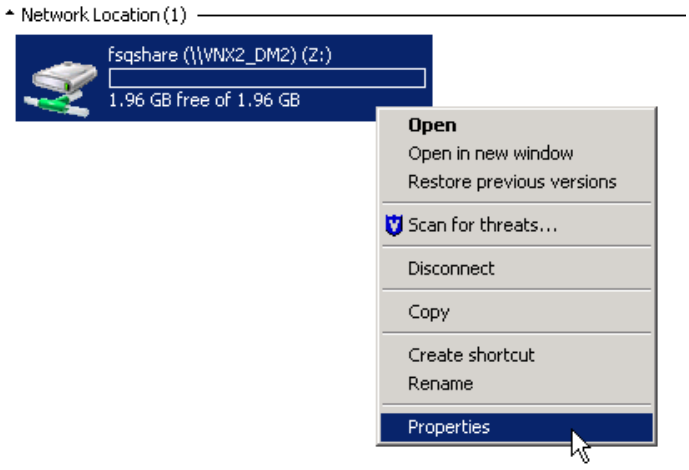


EMC² where information lives®

| Step | Action |
|---|---|
| 6 | **Create a CIFS share:**<br>• Create a CIFS share named **fsqshare** on **server_2** for the file system fsquota. Select the VNXxDM2 (where x is your team number.)<br>  |
| 7 | **Map a network drive to your fsqshare share:**<br>• Double-click **Computer** and select **Map network drive** from the top navigation bar**.**<br>  |

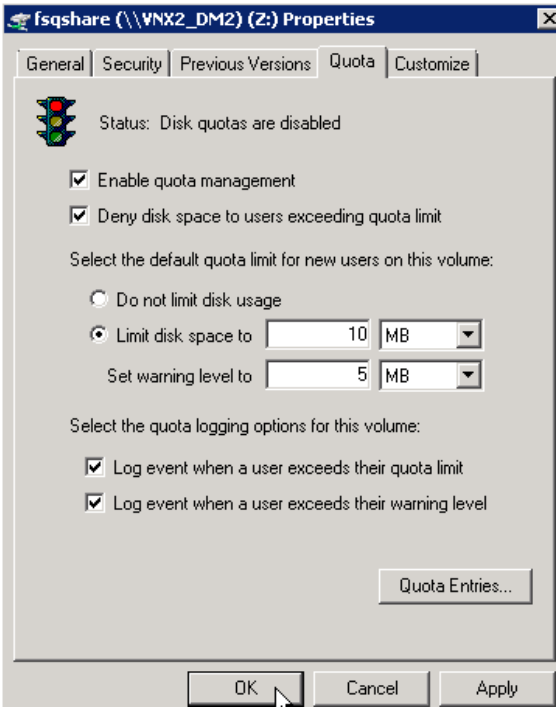


EMC² where information lives®

| Step | Action |
|---|---|
| | • Select **any available letter** for the **Drive:** and enter the following for **Folder:**<br><br>**\\VNX#_DM2\ fsqshare** (where # is your team number)<br><br>• Select **Reconnect at logon.**<br>• Click **Finish.**<br><br>Windows Security **might** require the authentication in the CORP domain.<br><br>  |
| 8 | **Enable quota management:**<br><br>• With the **Computer** window open, right-click your **fsqshare** (you may have to refresh the window to see the mapped drive).<br>• Select **Properties**.<br><br>  |

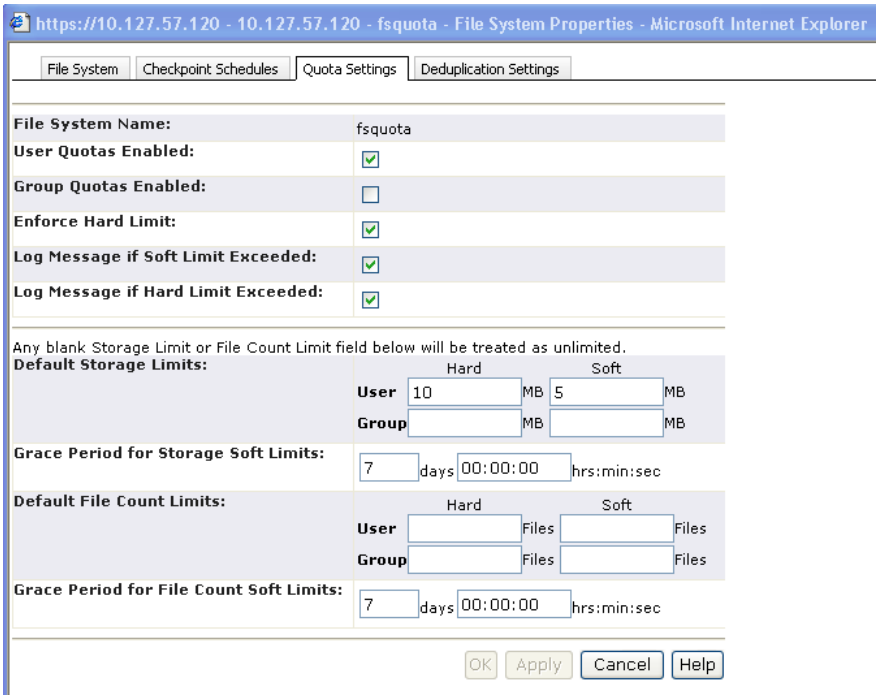


EMC² where information lives®

| Step | Action |
|---|---|
| | • Select the **Quotas** tab and select the **Enable quota management** checkbox.<br>• Select the **Deny disk space** to users exceeding quota limit checkbox.<br>• Limit disk space to = **10 MB (hard quota)**<br>• Enter the Set warning level to = **5 MB (soft quota)**<br>• Select **both** logging events.<br>• Click **OK** and confirm the Disk Quota usage.<br>  |

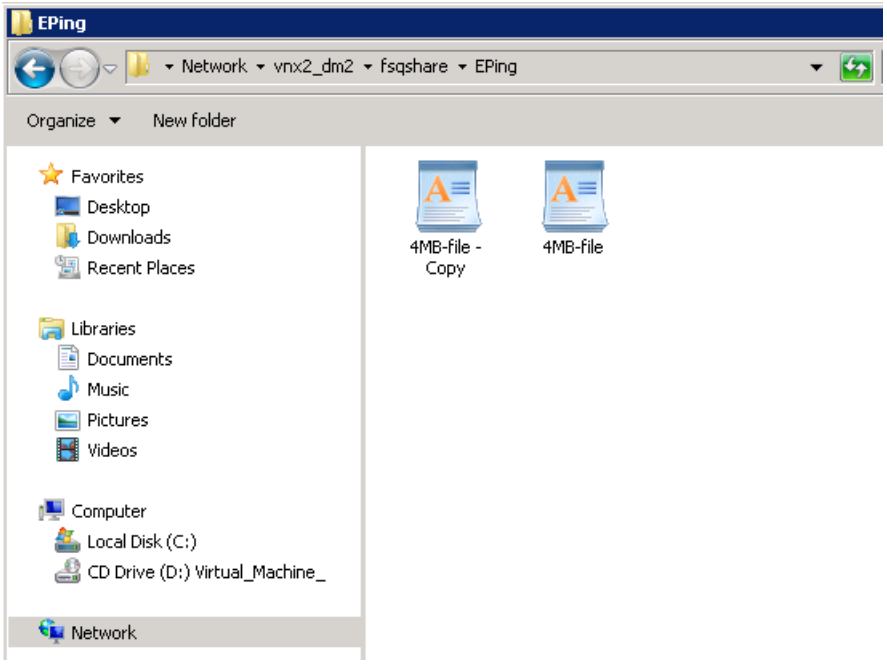
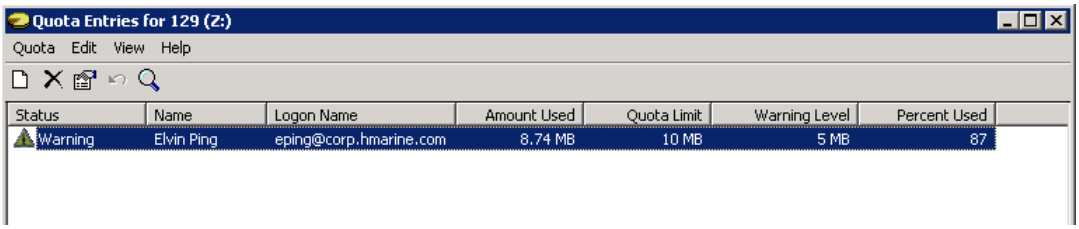


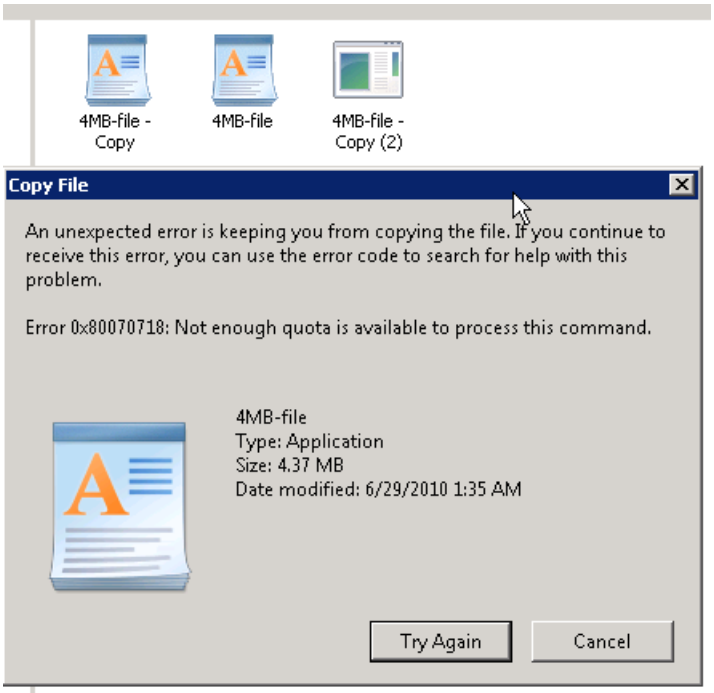
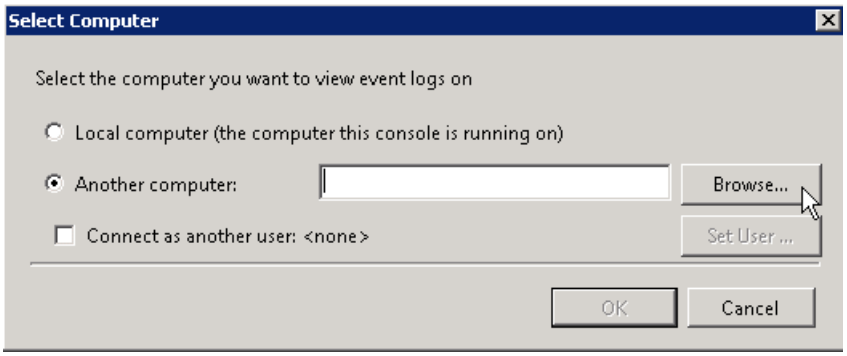
EMC² where information lives®

| Step | Action |
|---|---|
| 9 | **Verify quota configuration:**<br><br>• In Unisphere, from the Top Navigation bar, navigate to **Storage > File System**.<br>• Highlight the **fsquota** file system and click **Properties**.<br>• Select **Quota Settings**.<br><br>  <br><br><br>Are the values for **Default Storage Limits (Hard** and **Soft)** the same as you entered for quotas on the Windows share? _____ |
| 10 | **Test the soft quota limits:**<br><br>• Log off of your Windows workstation and log back in as **EPing**.<br>• On the **desktop** area of **EPing** you should see the file **4MB-file**. If not on the desktop, try searching the C: drive.<br>• Right-click the **4MB-file** file and choose **Copy**.<br>• Go back to your mapped drive fsqshare share and create a new folder called **EPing**.<br>• Open the **EPing** folder and, from the menu choose **Edit > Paste**. The 4MB-file file should now be copied into the EPing folder.<br>• Make another copy of the 4MB-file file in the EPing folder. Now you should have **two files** in the EPing folder.<br>• A message should appear indicating you have **exceeded your soft quota limit**. |

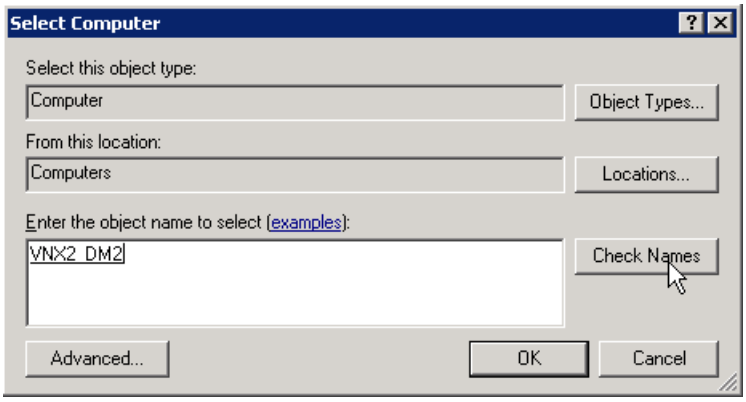


EMC² where information lives®

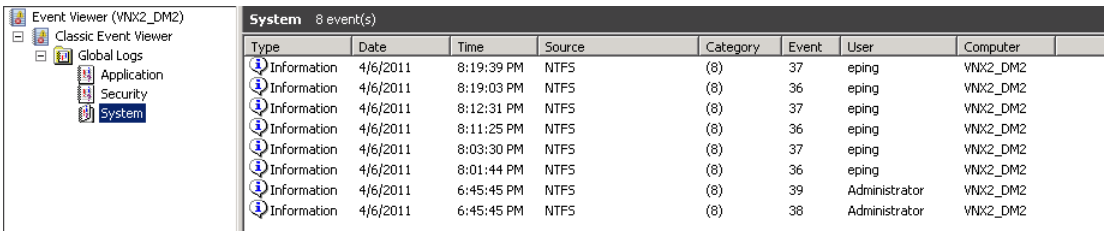
| Step | Action |
|---|---|
| 11 |  |
| 12 | **Monitor quota information:**<br>• Log off of your Windows workstation and log back on as the Administrator.<br>• Open the **Properties** window of your mapped network drive and select the **Quotas** tab.<br>• Click **Quotas Entries** to view the current quota information.<br>  <br>1. What is the status of Elvin Ping for this file system? _____<br>2. What is the amount used for Elvin Ping? _____<br>3. What is the warning level for Elvin Ping? _____ |
| 13 | **Test the hard quota limits:**<br>• Log off of your Windows workstation and log back on as **EPing**.<br>• Open a window to your mapped **fsqshare** drive.<br>• Open the **Eping Folder** and copy the **4MB-file** file once again. |

| Step | Action |
|---|---|
| | • Verify if you received the following error message regarding the quota limit being reached.<br>  |
| 14 | **Monitor System logs:**<br>• Log off your team's Windows workstation and log back on as Administrator.<br>• Open the Windows Event Viewer MMC (Microsoft Management Console) by clicking **Start > Run** and entering **eventvwr.msc**<br>• Connect Event Viewer to your Data Mover by right-clicking **Event View (Local)** in the left window pane and choosing **Connect to another computer.**<br>• In the **Select Computer** option, click **Browse** and find your CIFS server and then click **OK.**<br>  |

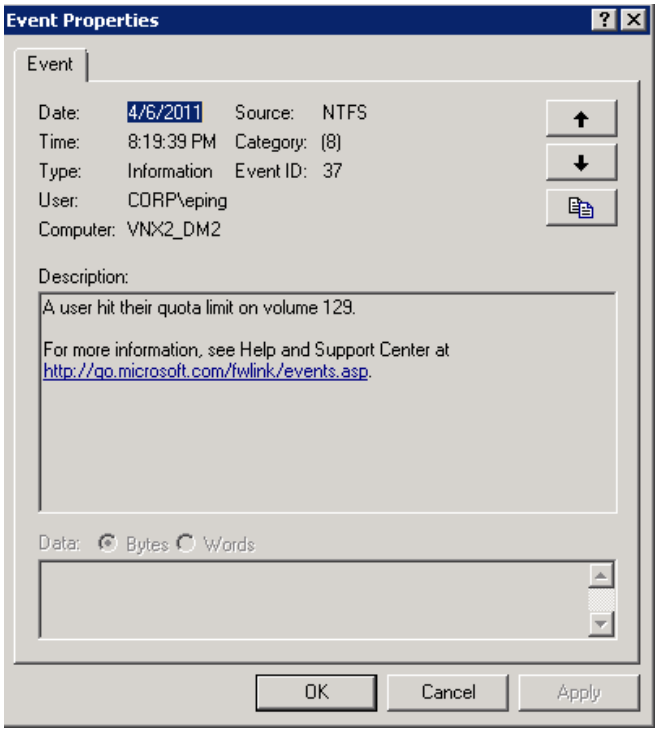
| Step | Action |
|---|---|




- In the left window pane of the Event Viewer window, select the **System log** of the CIFS server.

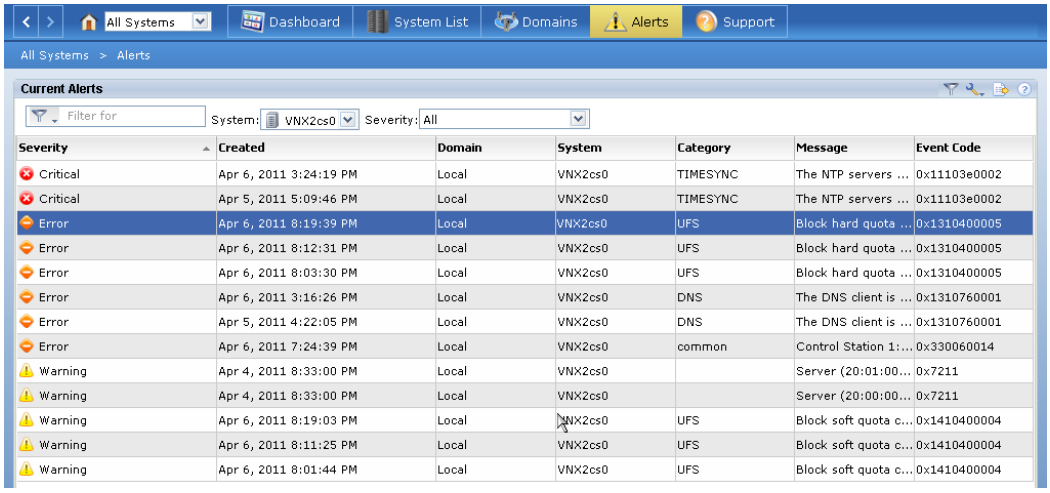
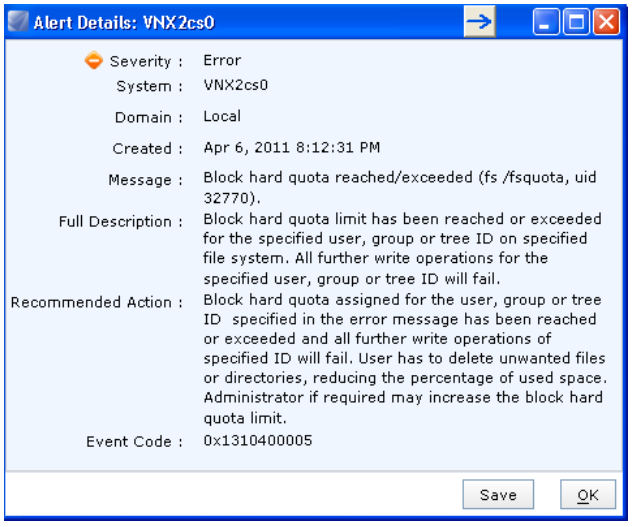

Event Viewer (VNX2_DM2)
Classic Event Viewer
Global Logs
Application
Security
System
System 8 event(s)
Type Date Time Source Category Event User Computer
Information 4/6/2011 8:19:39 PM NTFS (8) 37 eping VNX2_DM2
Information 4/6/2011 8:19:03 PM NTFS (8) 36 eping VNX2_DM2
Information 4/6/2011 8:12:31 PM NTFS (8) 37 eping VNX2_DM2
Information 4/6/2011 8:11:25 PM NTFS (8) 36 eping VNX2_DM2
Information 4/6/2011 8:03:30 PM NTFS (8) 37 eping VNX2_DM2
Information 4/6/2011 8:01:44 PM NTFS (8) 36 eping VNX2_DM2
Information 4/6/2011 6:45:45 PM NTFS (8) 39 Administrator VNX2_DM2
Information 4/6/2011 6:45:45 PM NTFS (8) 38 Administrator VNX2_DM2

- In the right window pane, double-click the event at the top of the list.



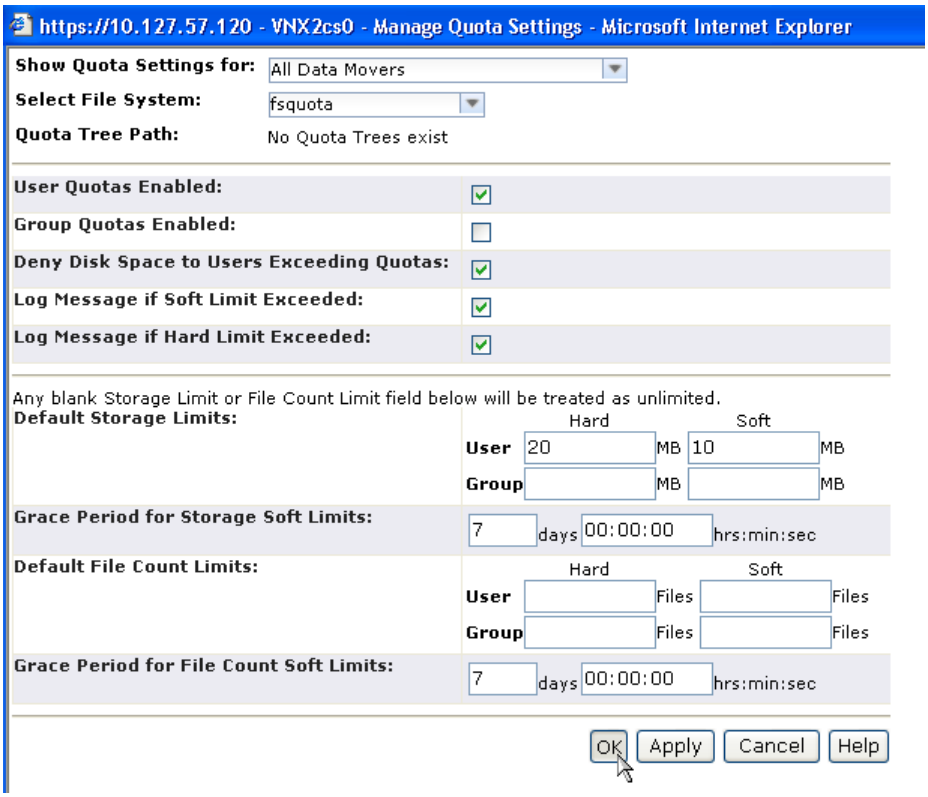



EMC² where information lives®

| Step | Action |
|---|---|
| | When did they reach the hard quota ?_____<br>• Click the down-arrow to view the previous event. Repeat this Step to view all logged events. |
| 15 | **Verify VNX quota alerts:**<br>• In Unisphere, from the Top Navigation bar, click **Home** (House) and then click **Alerts**.<br>• Take a look at the ***Alerts by Severity*** window (the Alerts may take a few minutes to appear in the main page).<br>  <br>  <br>1. When did they exceed the soft quota? _____<br>2. When did they reach the hard quota? _____ |

All Systems
Dashboard
System List
Domains
Alerts
Support
All Systems > Alerts
Current Alerts
Filter for
System: VNX2cs0
Severity: All
Severity | Created | Domain | System | Category | Message | Event Code
Critical | Apr 6, 2011 3:24:19 PM | Local | VNX2cs0 | TIMESYNC | The NTP servers ... | 0x11103e0002
Critical | Apr 5, 2011 5:09:46 PM | Local | VNX2cs0 | TIMESYNC | The NTP servers ... | 0x11103e0002
Error | Apr 6, 2011 8:19:39 PM | Local | VNX2cs0 | UFS | Block hard quota ... | 0x1310400005
Error | Apr 6, 2011 8:12:31 PM | Local | VNX2cs0 | UFS | Block hard quota ... | 0x1310400005
Error | Apr 6, 2011 8:03:30 PM | Local | VNX2cs0 | UFS | Block hard quota ... | 0x1310400005
Error | Apr 6, 2011 3:16:26 PM | Local | VNX2cs0 | DNS | The DNS client is ... | 0x1310760001
Error | Apr 5, 2011 4:22:05 PM | Local | VNX2cs0 | DNS | The DNS client is ... | 0x1310760001
Error | Apr 6, 2011 7:24:39 PM | Local | VNX2cs0 | common | Control Station 1:... | 0x330060014
Warning | Apr 4, 2011 8:33:00 PM | Local | VNX2cs0 | | Server (20:01:00... | 0x7211
Warning | Apr 4, 2011 8:33:00 PM | Local | VNX2cs0 | | Server (20:00:00... | 0x7211
Warning | Apr 6, 2011 8:19:03 PM | Local | VNX2cs0 | UFS | Block soft quota c... | 0x1410400004
Warning | Apr 6, 2011 8:11:25 PM | Local | VNX2cs0 | UFS | Block soft quota c... | 0x1410400004
Warning | Apr 6, 2011 8:01:44 PM | Local | VNX2cs0 | UFS | Block soft quota c... | 0x1410400004

Alert Details: VNX2cs0
Severity : Error
System : VNX2cs0
Domain : Local
Created : Apr 6, 2011 8:12:31 PM
Message : Block hard quota reached/exceeded (fs /fsquota, uid 32770).
Full Description : Block hard quota limit has been reached or exceeded for the specified user, group or tree ID on specified file system. All further write operations for the specified user, group or tree ID will fail.
Recommended Action : Block hard quota assigned for the user, group or tree ID specified in the error message has been reached or exceeded and all further write operations of specified ID will fail. User has to delete unwanted files or directories, reducing the percentage of used space. Administrator if required may increase the block hard quota limit.
Event Code : 0x1310400005
Save
OK

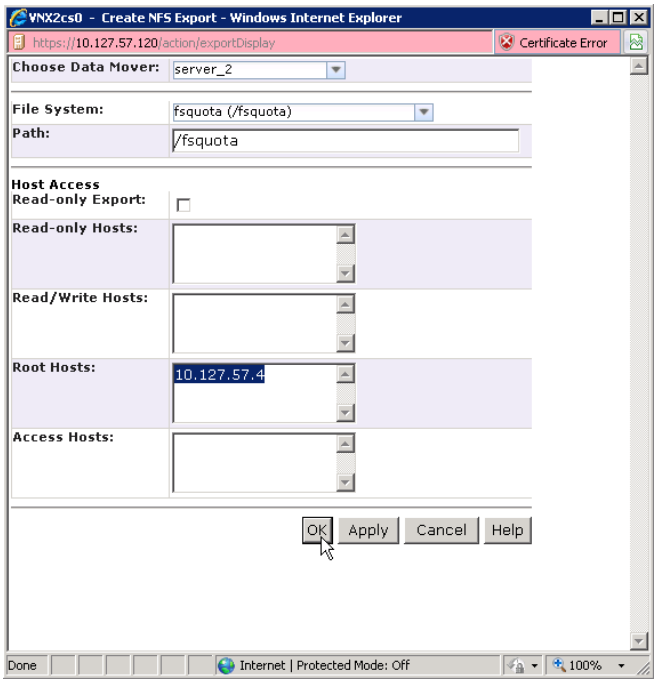
| Step | Action |
|---|---|
| 16 | **Modify the quota configuration to double quota limits:**<br><br>• From the Top Navigation bar, navigate to **Storage > Storage Configuration > File Systems**.<br>• Highlight the **fsquota** file system and click **Manage Quota Settings**.<br>• Change **Default Storage Limits:** for users to **20MB hard** and **10MB soft.**<br>• Click **OK.**<br><br>  |
| 17 | **Verify quota configuration:**<br><br>• Open the **Properties** of your mapped network drive and select the **Quotas** tab.<br><br>1. What values are now shown for ”Limit disk space to”? _____<br><br>2. What values are now shown for ”Set warning level to”? _____ |

*End of Lab Exercise 10 Part 1*



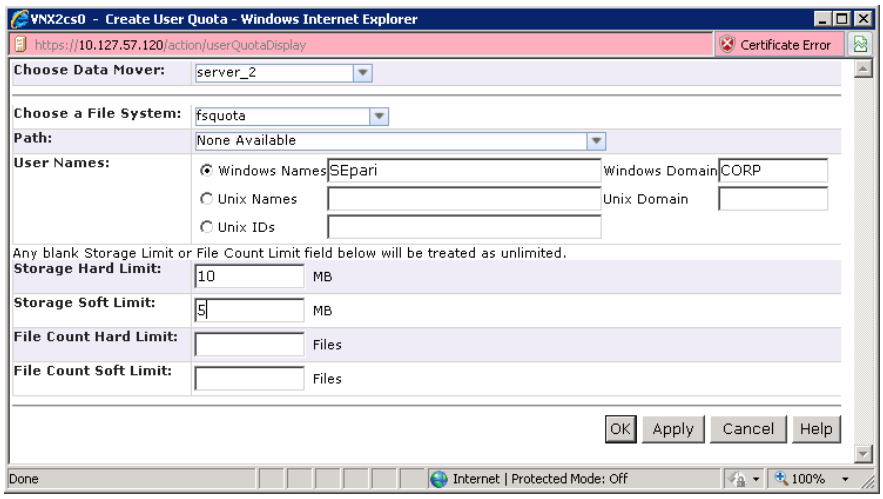
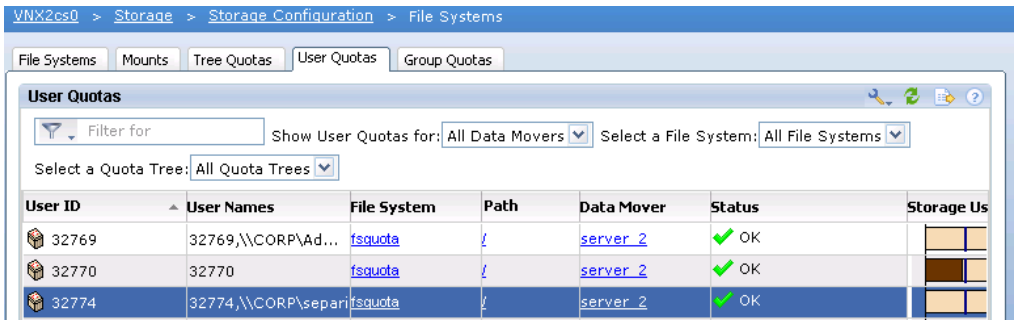
EMC² where information lives®

# Lab 10: Part 2 – View Quota Reports from a Linux Client

| Step | Action |
|---|---|
| 1 | **Export the fsquota file system for NFS:**<br><br>• In Unisphere, from the Top Navigation bar, of EMC Unisphere, navigate to **Storage > Shared Folders > NFS > Create**.<br>• Select the **fsquota** file system from the drop-down list<br>• In the **Root Hosts** fields enter the IP address of your team's Linux client.<br>• Click **OK**.<br><br>  |
| 2 | **View quota information from Linux:**<br><br>• Using Putty, login to your Linux host using the credentials from the Appendix.<br>• Create a directory called **quotas** and mount the **fsquota** file system.<br><br>`# cd /`<br><br>`# mkdir /quotas`<br><br>`# mount <data_mover_ipAddr>:/fsquota /quotas` |



EMC² where information lives®

| Step | Action |
|---|---|
| | • Execute the following command to report the user quota for CORP\EPing (UID: 32770) in the mounted file system.<br><br>`# quota -v 32770`<br><br>`Disk quotas for user #32770 (uid 32770):`<br>`Filesystem blocks quota limit grace files quota limit grace`<br>`10.127.57.124:/fsquota 8952 10240 20480 3 0 0` |
| 3 | **Configure user quota in Unisphere:**<br><br>• From the Top Navigation bar, navigate to **Storage > Storage Configuration > File Systems > User Quotas tab.**<br>• Click **Create**.<br><br>  <br><br><br>• Select the **fsquota** file system and select the **Windows Names** radio button and enter **SEpari** for the Windows name and **CORP** for Windows Domain.<br>• Set the Storage hard quota to **10GB** and the Soft quota to **5GB**.<br>• Click **OK** to close the window and save the changes. The new user quota configuration is displayed.<br><br>  <br><br><br>• Write down the user ID of the CORP\SEpari user. |



EMC² where information lives®

| Step | Action |
|---|---|
| 4 | **Verify the quota configuration:**<br>• From the Putty session to your Linux workstation execute the following. Run the quotas report for the user CORP/SEpari.<br>`# quota -v 32774`<br>`Disk quotas for user #32774 (uid 32774):`<br>`Filesystem blocks quota limit grace files quota limit grace`<br>`10.127.57.124:/fsquota 0 5120 10240 0 0 0` |
| 5 | **Lab cleanup:**<br>• Umount the **fsquota** file system from your Linux workstation.<br>• Delete the **quotas** directory and exit from your Linux workstation.<br>• Go back to Unisphere and delete the **fsqshare** share.<br>• Delete the **fsquota** file system. |

*End of Lab Exercise 10*

# Lab Exercise 11: CIFS Features

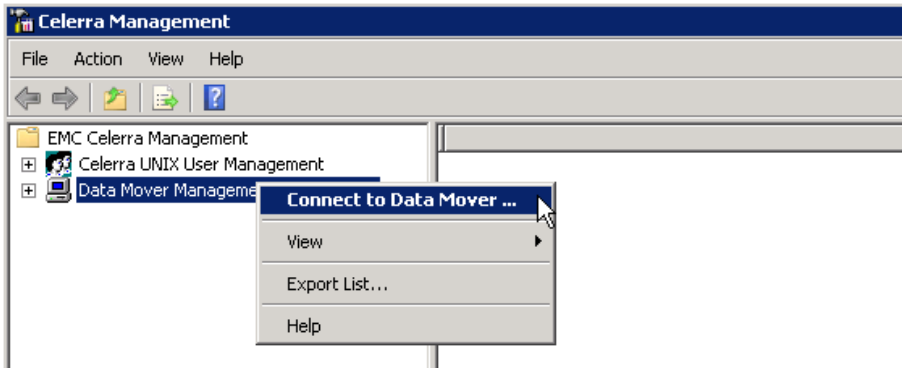
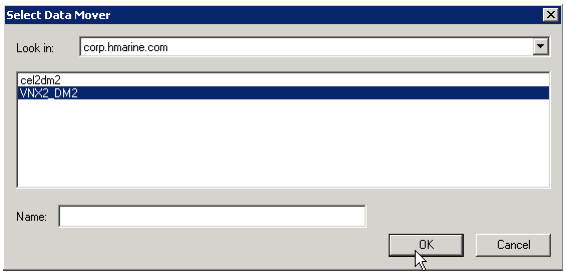
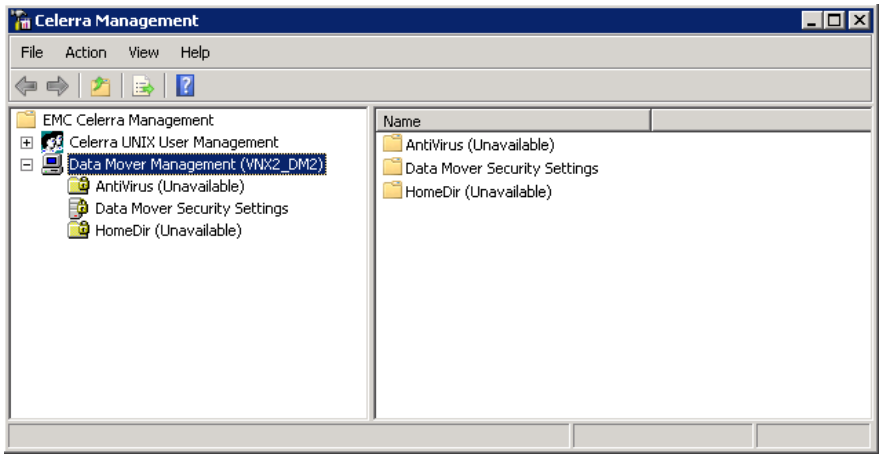
| | |
|---|---|
| **Purpose:** | To configure home directories and file extension filtering on a CIFS environment, and to configure a DFS root file system. This lab exercise uses the 32-bit Celerra Management Tool that has already been installed for you. This tool can be located in the DART 6.0 Apps and Tools CD which can be found in the Celerra Software Downloads on PowerLink. Look for NAS Apps and Tools CD in the description.<br><br>You will be working with your **WIN-X VM Host** (where **X** is your team number) for this lab. |

| | |
|---|---|
| **Tasks:** | In this lab exercise, you will perform the following tasks:<br><br>• Configure a CIFS Audit Policy<br><br>• Configure CIFS for home directories |



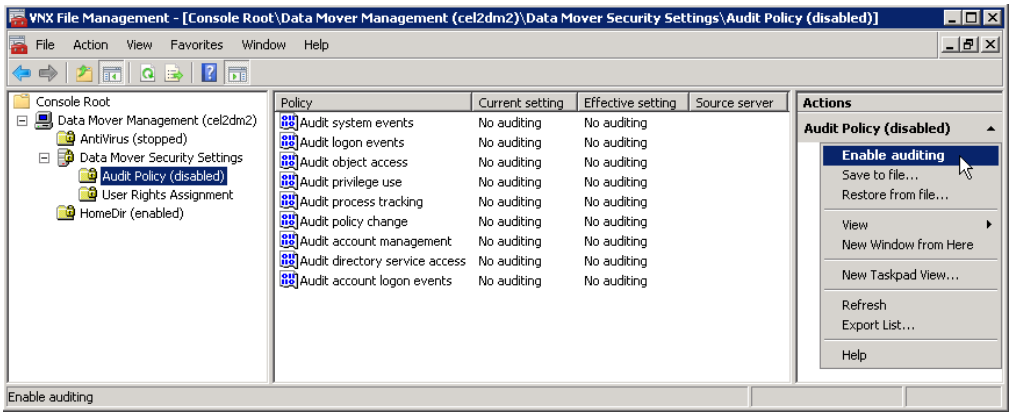
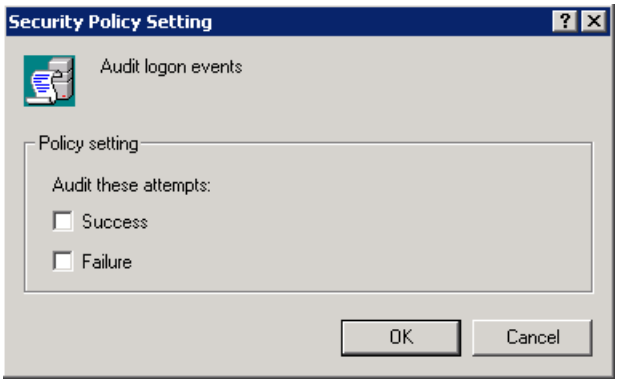
EMC² where information lives®

# Lab 11: Part 1 - Configure a CIFS Audit Policy

| Step | Action |
|---|---|
| 1 | **Connect Data Mover to Data Mover Management tool:**<br><br>• Click **Start > All Programs > Administrative Tools** > **Celerra Management**.<br>• On the left pane right-click the **Data Mover Management** and select **Connect to Data Mover…**<br><br>  <br><br>• Select the CIFS server you previously created (VNX#_DM2).<br><br>  <br><br>• Click **OK**. The Snap-in extensions are displayed for the CIFS server.<br><br>  |

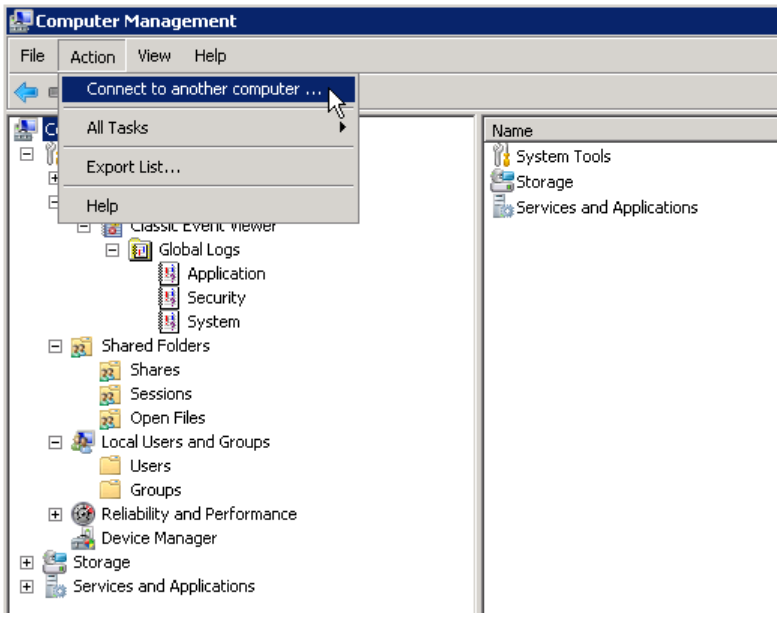
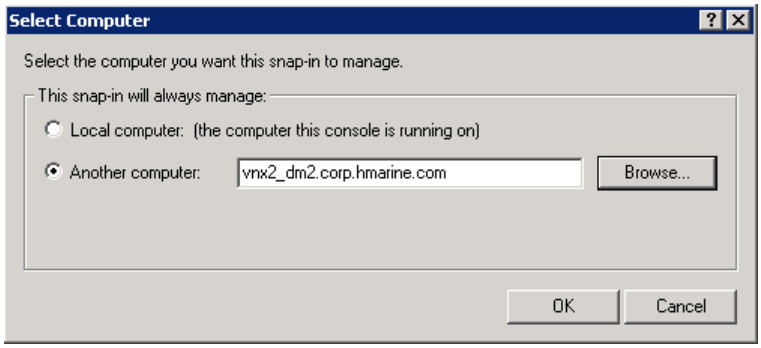


EMC² where information lives®

| Step | Action |
|---|---|
| 2 | **Enable Auditing using Data Mover Management:**<br><br>• Expand the Data Mover Management tree in the console<br>• Expand the **Data Mover Security Settings**<br>• Right-click the **Audit Policy** folder or click on the Actions in the right pane.<br>• Select **Enable auditing** from the drop-down menu<br><br>  <br><br><br>• Set **Success** and **Failure** on the following policies:<br>**Audit logon events**<br>**Audit object access**<br>**Audit account logon events**<br><br>  <br><br><br>• Do **not** close the Data Mover Management snap-in. |

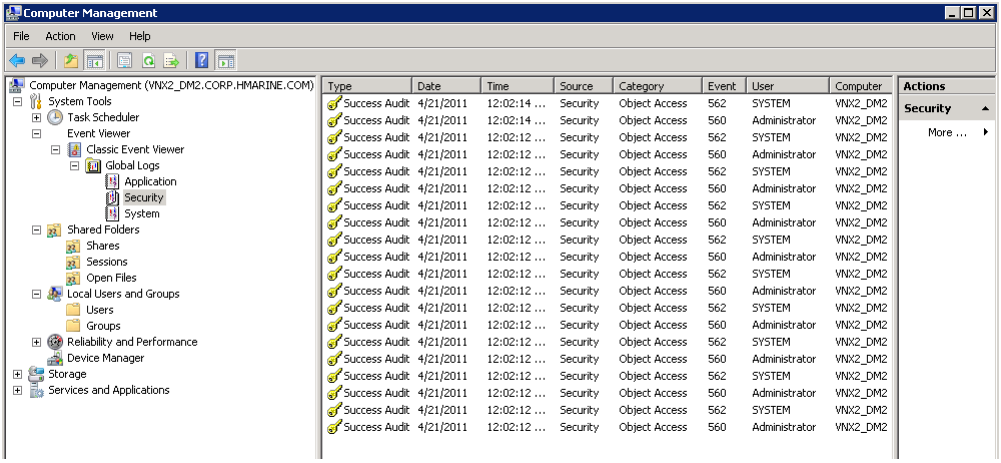
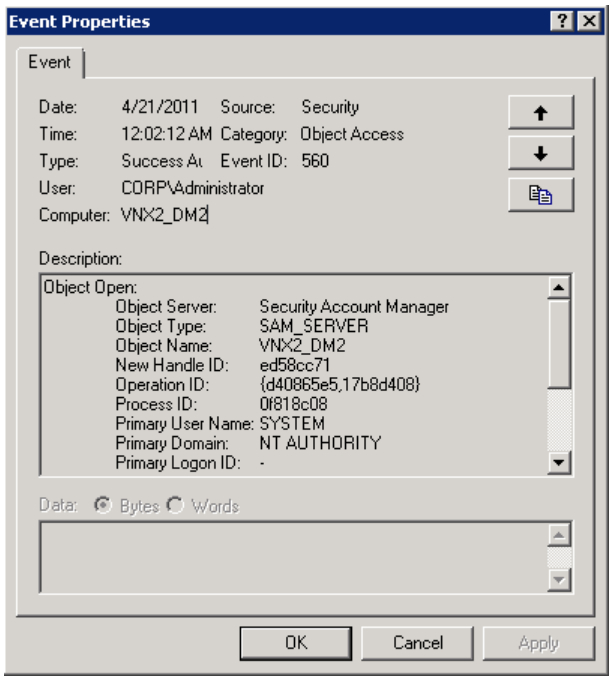


EMC² where information lives®

| Step | Action |
|---|---|
| 3 | **View the logs:**<br><br>• Click Start **> All Programs > Administrative Tools > Computer Management**.<br>• From the Top Menu select **Action** and **Connect to another Computer**<br><br>  <br><br><br>• Choose the **Another computer** radio button and click **Browse.**<br>• In the object field enter the name of your CIFS server **VNX#_DM2** (where # is your team number) and click **OK**.<br><br>  <br> |



EMC² where information lives®

| Step | Action |
|---|---|
| | • Expand the **Event Viewer** on the left pane and select the **Security** folder.<br>• If the Security folder is not populated with events, click **Refresh** on the top menu.<br>  <br>• Double-click any event from the list to view its log entry information.<br>  |



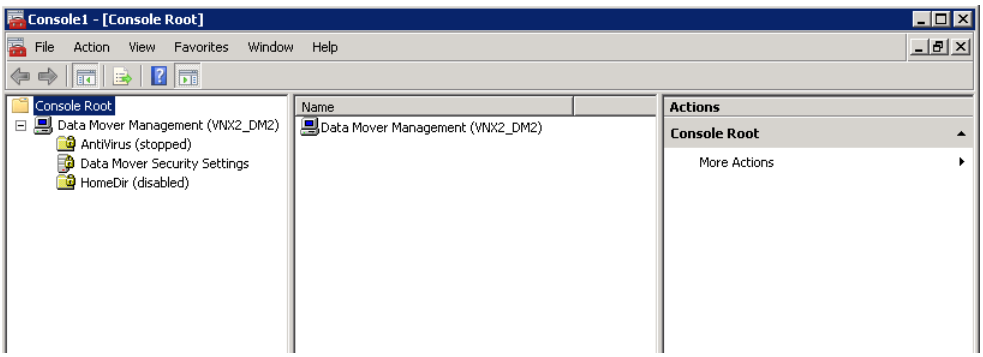
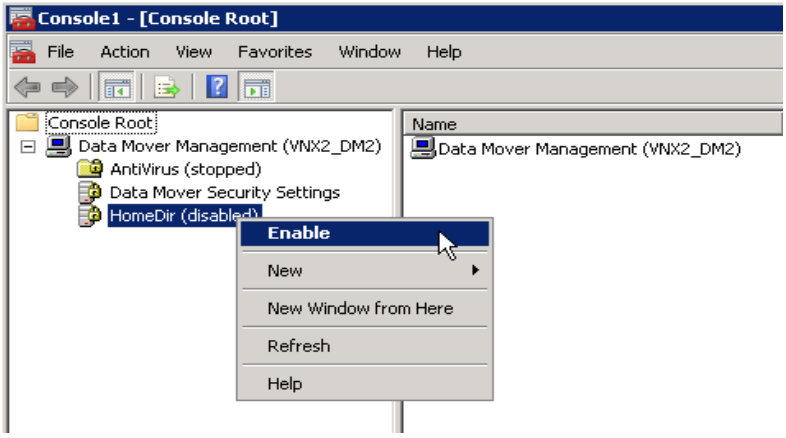


*End of Lab Exercise 11 Part 1*



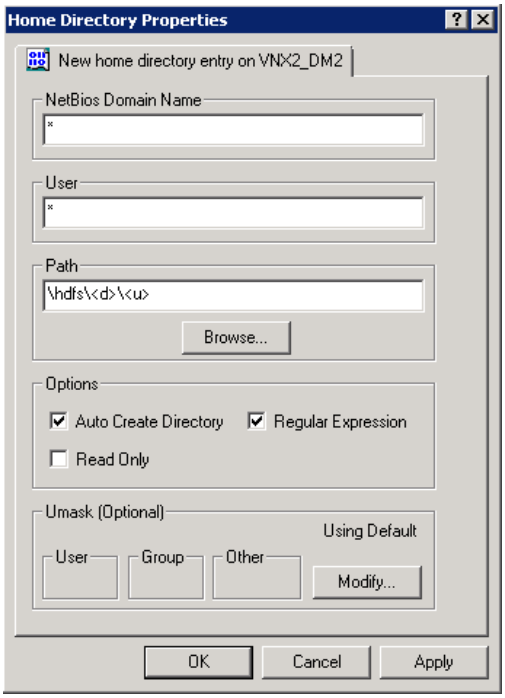
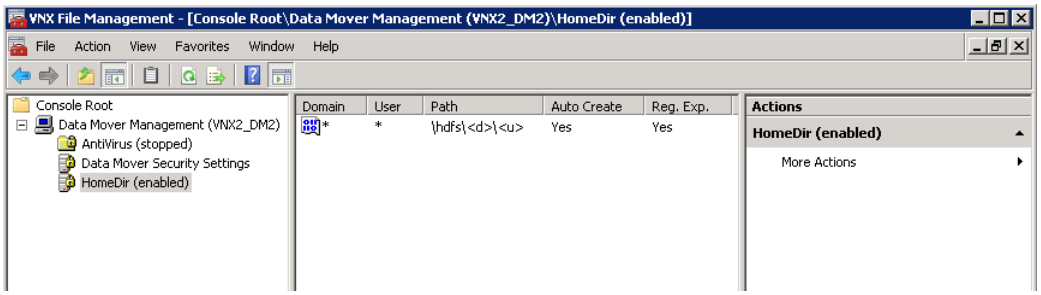
EMC² where information lives®

# Lab 11: Part 2 - Configuring CIFS for Home Directories

| Step | Action |
|---|---|
| 1 | **Create a file system:**<br><br>• In Unisphere, create a file system named **hdfs** using the clarsas_archive storage pool. Make the file system at least 1 GB (1024 MB) in size. Keep all defaults. |
| 2 | **Enable Home Directory using the Data Mover Management snap-in:**<br><br>• Go back to the Data Mover Management snap-in that is connected to your VNX#_DM2 (where # is your team number) CIFS server.<br><br>  <br><br><br>• Expand the Data Mover Management tree in the console.<br>• Right-click the **HomeDir** folder and select **Enable** from the drop-down menu.<br>• Click **YES** to the error message that shows up.<br><br>  <br> |

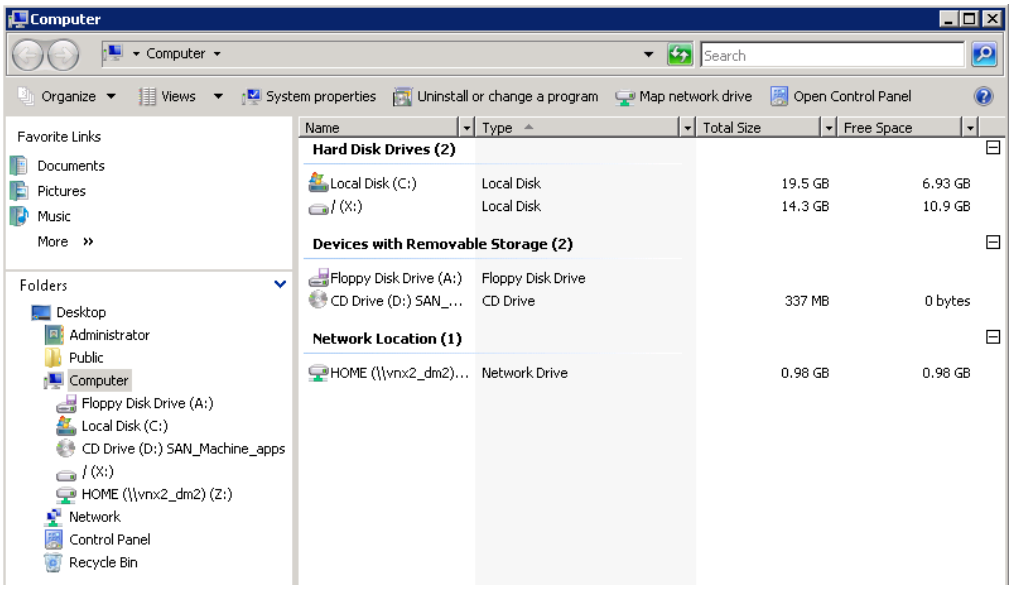


EMC² where information lives®

| Step | Action |
|---|---|
| 3 | **Create a new Home Directory entry:**<br><br>• Use the "*" wildcard for the domain and user fields.<br>• For the Path field, enter the newly created file system and the <d> and <u> regular expressions separated by a "\". The expression <d> stands for domain and <u> for user.<br>• Ensure the **Auto Create Directory** and **Regular Expression** options are selected.<br>• Click **OK.**<br><br>  <br><br><br>Once you click OK you should see the HomeDir enabled inside the Data Mover Management tree. Inside the right side panel you will see the previously input expressions displayed.<br><br>  <br> |



EMC² where information lives®

| Step | Action |
|---|---|
| 4 | **Test the VNX Home Directories feature:**<br><br>• Log off your team's Windows workstation and log back on as **EPlace**.<br>• Open **Computer**.<br><br>1. Is the Home drive mapped for the User? _____<br><br>  <br><br><br>If the Home Directory is set in the user profile at Active Directory, its path will be automatically mapped to the designated local drive. If not, the user would have to manually map a local drive to the Home folder.<br><br>• Create a text file in the user's home share and name it **eplace.txt**<br>• Log off your team's Windows workstation and log back on as **EPing**.<br>• Open **Computer**.<br><br>2. Can you see the mapped network drive? _____<br><br>3. Can you see the file created by the last user?_____<br><br>• Create a new text file in the user's home share and name it **eping.txt** |

*End of Lab Exercise 11*



EMC² where information lives®

# Lab Exercise 12: Networking Features

| | |
|---|---|
| **Purpose:** | To configure a Data Mover to support Link Aggregation, and also to test Fail Safe Network.<br><br>You will be working with your **Linux-X VM Host** (where **X** is your team number) for this lab.<br><br>**Inform the instructor that the switch setup script must be enabled prior to start of the lab. If the ethernet switch is not set up properly the lab will not work as written.** |

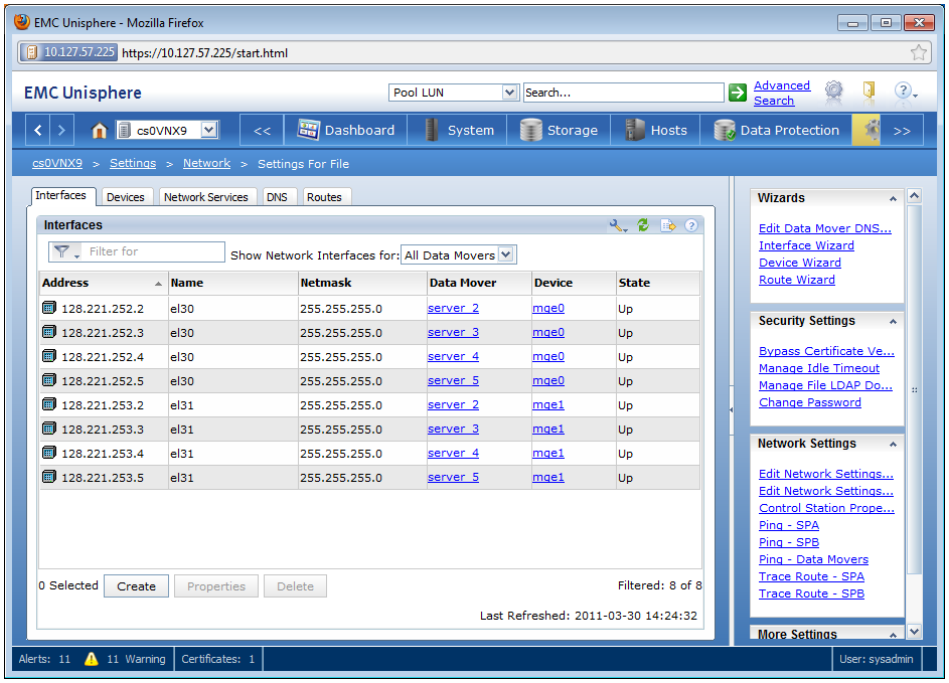
| | |
|---|---|
| **Tasks:** | In this lab exercise, you will perform the following tasks:<br><br>• Configure a Data Mover for Link Aggregation<br><br>• Configure a Data Mover for Fail Safe Network |

| | |
|---|---|
| **References:** | Configuring and Managing Network High Availability on VNX - P/N 300-011-811 - REV A01 |



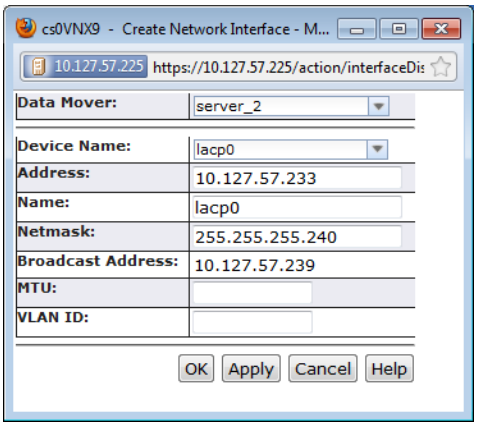
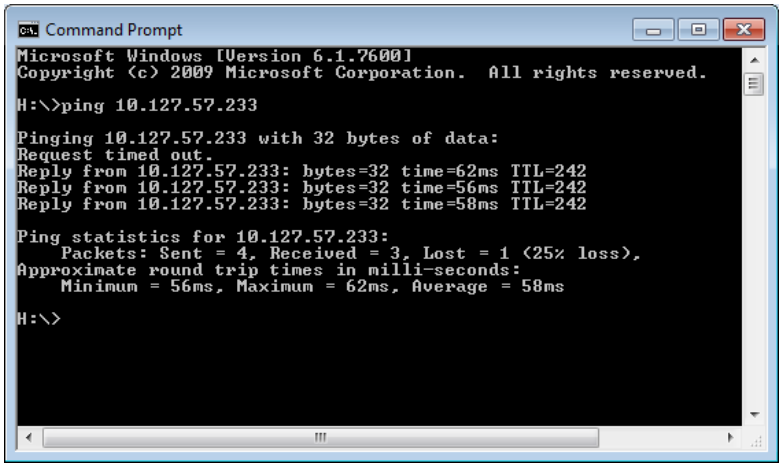
EMC² where information lives®

# Lab 12: Part 1 – Configuring LACP

| Step | Action |
|---|---|
| 1 | **Delete network interfaces:**<br><br>• Log into **Unisphere** from your Windows workstation and access your **VNX** system.<br>• Navigate to **Settings > Network > Settings For File** and click the **Interfaces** tab. Delete the network interfaces you have previously created. The screen below shows what the interface tab should look like after you delete all the interfaces previously created. You should only see IP addresses starting with 128.<br><br>  <br><br><br>**Note:** If you are unable to delete an interface, inform your instructor. |
| 2 | **Create a virtual device for link aggregation:**<br><br>• Configure a virtual device on the Data Mover as link aggregation and name it **lacp0**.<br>• Click the **Devices** tab and click **Create**.<br>  • Data Mover: **server_2**<br>  • Type: **Link Aggregation**<br>  • Device Name: **lacp0**<br>  • Select **cge-1-0** and **cge-1-1**<br>  • Speed and Duplex: **Auto**<br>• Click **OK**. |



EMC² where information lives®

| Step | Action |
|---|---|
| | • Click the **Interfaces** tab and click **Create**. Configure your Interface with the following information.<br>○ Data Mover: server_2<br>○ Device Name: lacp0<br>○ Address: **VNX#_DM2 cge-1-0** IP address. See Appendix.<br>○ Name: lacp0<br>○ Netmask: **VNX#_DM2 cge-1-0** netmask address. See Appendix<br>○ Broadcast Address: Will be automatically created<br>○ MTU: None<br>○ VLAN ID: None<br>  |
| 3 | **Verify that the interface is up:**<br>• Test your IP configuration by pinging the newly created interface.<br>  <br>**Note:** If this operation fails please verify that a default route has been created (via the route tab) and ensure the correct information has been entered for the interface. |

| Step | Action |
|---|---|
| 4 | **Create a file system and export it for NFS:**<br>• **Create a 5 GB (5120 MB) file system named fsha and export it for NFS putting the IP of your Linux workstation in the Root field of the export. Keep all defaults (refer to the Network and File System Configuration lab exercise if you need help.)** |
| 5 | **Log on to your Linux VM workstation:**<br>• Create a directory on your Linux workstation named **/studentx** (where X is the number of your team) and mount the /fsha export to the /studentX mountpoint.<br>• Change to the **/studentX** directory<br>`# cd /studentx`<br>• Copy the directory /opt as /myopt<br>• `# cp –R /opt ./myopt` |



EMC² where information lives®

| Step | Action |
|---|---|
| 6 | **Test Link Aggregation configuration:**<br><br>• Run a do-while loop in the directory to test connectivity<br><br>**# while true**<br>**> do**<br>**> ls -al**<br>**> done**<br><br>• **Do not** close the window that is running the do-while loop.<br>• Open **another Putty session** to log in to your VNX Control Station.<br>• Enter the following command:<br><br># **server_netstat server_2 -i**<br><br>1. What are the "Obytes" values for cge-1-0 and cge-1-1?<br><br>cge-1-0 _____<br><br>cge-1-1_____<br><br>• Use the **up arrow** on your keyboard to recall the last command. Press enter to run the command again.<br><br>2. What are the "Obytes" values for cge-1-0 and cge-1-1?<br><br>cge-1-0 _____<br><br>cge-1-1_____<br><br>Compare the values you have recorded to determine which port in your virtual device is being used for the connection. Please write that value here _____<br><br>**Note:** If you see little to no change in value, you have made a mistake in your initial configuration. Inform your instructor.<br><br>The following error was encountered by all VNX Teams on new VNX during the LACP Networking lab.<br><br>**server_snmpwalk : error msg : The system hostname key is missing from the lockbox.**<br>**Name Mtu Ibytes Ierror Obytes Oerror PhysAddr**<br>*****

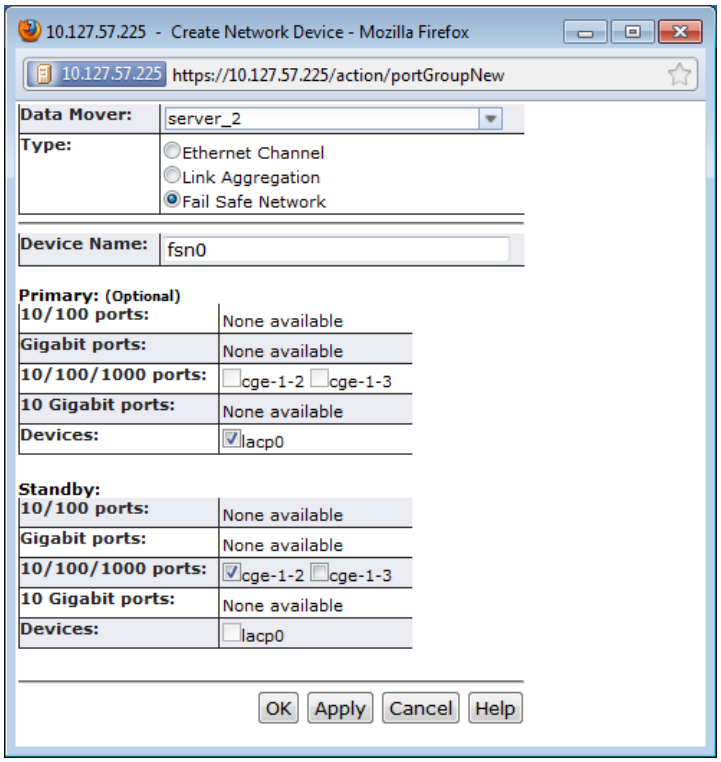
| Step | Action |
|---|---|
| | • **Ask your instructor to disable the switch port** to which your active Data Mover port is connected. Use the Appendix to complete this task.<br>• You should still have your **second** Putty session to the Control Station open. Use the **up arrow** on your keyboard to recall the last command and press Enter to run the command again.<br><br>3. What are the "Obytes" values for cge-1-0 and cge-1-1?<br><br>cge-1-0 _____<br><br>cge-1-1_____<br><br>• Use the **up arrow** on your keyboard to recall the last command and press Enter to run the command again.<br><br>4. What are the "Obytes" values for cge-1-0 and cge-1-1?<br><br>cge-1-0 _____<br><br>cge-1-1_____<br><br>Compare the values you have recorded to determine which port in your virtual device is being used for the connection. Data is now passing through the opposite port you noted in the previous page.<br><br>• Verify that the do-while loop is still running from your Linux workstation.<br>• Ask your instructor to **re-enable** the switch port which was disabled. (The network traffic should be redirected back to the original port.)<br>• Exit from your second Putty session.<br>• Stop the do-while loop running on your Linux workstation by pressing **Ctrl-c**.<br>• Unmount the NFS export.<br>• Exit from your Linux Workstation. |
| 7 | **Lab Cleanup:**<br><br>• Remove the **IP configurations** from lacp0. Only delete the IP address assigned to the virtual device, not the virtual device itself. It will be used in the next lab. |

*End of Lab Exercise 12 Part 1*



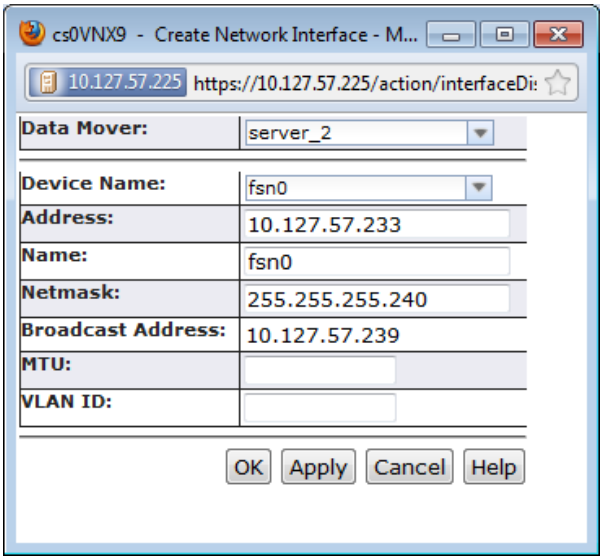
EMC² where information lives®

# Lab 12: Part 2 – Configure an FSN Device

| Step | Action |
|---|---|
| 1 | **Create a FSN virtual device:**<br>• From the top navigation pane, select **Settings > Settings for File** and click the **Devices** tab<br>  • Data Mover: **server_2**<br>  • Type: **Fail Safe Network**<br>  • Device Name: **fsn0**<br>  • Primary (optional): **lacp0**<br>  • Standby: **cge-1-2**<br>• Click **OK**.<br>  |



EMC² where information lives®

| Step | Action |
|---|---|
| 2 | **Configure FSN IP Address:**<br><br>• To assign the IP address, select the **Interfaces** tab and click **Create**.<br>• Select **server_2**, enter a device name of **fsn0**, and enter the appropriate address and netmask. Use the same address and netmask that were used in the previous lab.<br>• Leave the MTU and VLAN ID fields blank.<br>• Click OK.<br><br>  <br><br><br>Examine the virtual device configuration for your Data Mover. Which FSN device is currently "active"?<br><br>_____ |
| 3 | **Log on to your Linux VM workstation:**<br><br>• NFS mount the /**fsha** export to the /**studentX** (where X is the number of your team) mountpoint on your workstation.<br>• Change to the **/studentX** directory<br><br>`# cd /studentx`<br><br>• Copy the directory /opt as /myopt<br><br>`# cp –R /opt ./myopt` |



EMC² where information lives®

| Step | Action |
|---|---|
| 4 | **Test FSN Device configuration:**<br><br>• Run a do-while loop in the directory to test connectivity<br><br>`# while true`<br>`> do`<br>`> ls -al`<br>`> done`<br><br>• **Do not** close the window that is running the do-while loop.<br>• Open **another Putty session** to log in to your VNX Control Station.<br>• Enter the following command:<br><br>`# server_netstat server_2 -i`<br><br>1. What are the "Obytes" values for cge-1-0, cge-1-1, and cge-1-2?<br><br>cge-1-0 _____<br><br>cge-1-1_____<br><br>cge-1-2_____<br><br>• Use the **up arrow** on your keyboard to recall the last command and press Enter to run the command again.<br><br>2. What are the "Obytes" values for cge-1-0, cge-1-1, and cge-1-2?<br><br>cge-1-0 _____<br><br>cge-1-1_____<br><br>cge-1-2_____<br><br>• Compare the values you have recorded to determine which port in your virtual device is being using for the connection. Please write that value here _____.<br>• Ask your instructor to disable the active port.<br><br>3. Does the traffic move to the second device in lacp0? _____<br><br>• Ask your instructor to disable the new active port.<br><br>4. Does the traffic move to the other device in fsn0? _____<br><br>5. Is the do-while loop still running? _____<br><br>• Check the status of your virtual devices in Unisphere. You should now see one trunk is "active" and the other is in "standby".<br><br>**Note:** You may have to refresh the page several times. |



EMC² where information lives®

| Step | Action |
|---|---|
| 5 | **Lab Cleanup:**<br>• Have your instructor re-enable all Ethernet ports for your Data Mover.<br>• Exit from your second Putty session.<br>• Stop the do-while loop running on your Linux workstation by pressing **Ctrl-c**.<br>• Unmount the NFS export.<br>• Exit from your Linux Workstation.<br>• Remove the **IP configurations** from fsn0 and delete the fsn0 device.<br>• Delete the **lacp0** virtual device. |

*End of Lab Exercise 12*

# Lab 13: Create an Event Monitor Template

| | |
|---|---|
| **Purpose:** | To create a Template for use with Event Monitor using EMC Unisphere.<br>You will be working with your **WIN-X VM Host** (where **X** is your team number) for this lab. |

| | |
|---|---|
| **Tasks:** | Students perform the following tasks:<br>• Determine which Templates are installed on a storage system<br>• Create a new Event Monitor Template<br>• Modify an existing Event Monitor Template<br>• Configure Event Monitor Template options<br>• Assign a Template to a storage system<br>• Configure a host to monitor a storage system |

| | |
|---|---|
| **References:** | VNX Block Deployment and Management Student Guide |

# Lab 13: Part 1 – Configuring a Centralized Monitor using the Configuration Wizard

| Step | Action |
|---|---|
| 1 | **System Login:**<br>• Login to Unisphere from your Windows workstation with your sysadmin account credential.<br>• From the Dashboard view, select your **VNX** from the All System dropdown lists and navigate to **System > Monitoring and Alerts > Notifications**. |
| 2 | **Add Portal:**<br>• Click on the **Centralized Monitors** tab.<br>• Click **Configure**.<br>• Right-click on the **Portal** icon and select **Add Portal**.<br>• From the **Add Portal** window, select your **VNX** from the **Available Systems** and move it to the **Selected Systems** window. Click **OK**. |
| 3 | **Add a Centralized Event Monitor:**<br>• The array should appear in the **Configure Centralized Monitor** window.<br>• Right-click on the array and select **Add Centralized Event Monitor**.<br>• For the purposes of this lab, type in the **IP address** of your **Windows VM host, WIN-X** (where X is your team number).<br>• Note: For centralized monitoring, the monitoring agent must be a host agent and be connected to the portal storage system. However, it cannot be performing data I/O to the storage system.<br>• The host will be added to the **Configure Centralized Monitor** window under the portal.<br>• Click OK. |
| 4 | **Verify Hosts:**<br>• Click the **Centralized Monitor** tab and verify the host appears.<br>• Note: This may take a minute or so, if it doesn't appear logout of the browser and launch it again. |


EMC² where information lives®

| Step | Action |
|---|---|
| 5 | **Create Template:**<br>• Click the **Configure** tab and select **Create Template**. Name the template **TeamX Template** where **X** is your team number.<br>• When the **Template Properties** window appears, make sure the **General** radio button is selected (default) and configure the following parameters:<br>  ○ Check the **Warning, Error** and **Critical** checkboxes<br>  ○ Check all the boxes for **Event Categories**<br>  ○ Check the **Log to System Log** checkbox<br>  ○ Ensure that the **Combine Events for Storage System** checkbox is unchecked<br>• Click **OK**. |
| 6 | **Add Response** button**:**<br>• Click **Add Response**.<br>• Name the new response **BDM**, and click **OK**. |
| 7 | **View BDM tab:**<br>• Click the **BDM** tab at the top right of **Template Properties**. The **BDM** tab was created when you created a new response. |
| 8 | **Program to Execute:**<br>• In the **Program to Execute** text entry area type:<br>  ○ For W2K8 and W2K3 systems type: c:\windows\system32\notepad.exe<br>  ○ For W2K systems: c:\winnt\system32\notepad.exe |
| 9 | **Program Parameters:**<br>• In the **Program Parameters** text entry area type: **c:\newfile.txt**<br>• Click Default Message and Click **Apply**. |
| 10 | **Navigate to your Agent:**<br>• Navigate to your **Agent** on your Windows hosts.<br>• Click **Start** and right click **Computer > Manage > Configuration > Services > Navisphere Agent**<br>• Right click the **Agent** and select **Properties**.<br>• Click the **Log On** tab.<br>• Verify the **Allow service to interact with desktop** checkbox is selected.<br>• Click **OK.** |


EMC² where information lives®

| Step | Action |
|---|---|
| 11 | **Test Button:**<br>• Your template should now be in the **Notification Templates** tab. Select your template and click **Properties**.<br>• Click on the **BDM** tab.<br>• Click **Test**.<br>• Select your **Windows host** as the host for the test. Click OK.<br>• Click **OK** at the completion message and close the window.<br>Note: If you are running through Terminal Services, Notepad will not be visible on the desktop. You may instead view the running processes – it will appear there. |
| 12 | **View Response Log:**<br>• Click the **Centralized Monitors** tab. Right click your Centralized Monitor Windows host.<br>• Open the **View Response Log**, and **View Message File**. They should all show that a test event was generated.<br>• Look for your **m####s** in the **Message File Selection**. Highlight one m### at a time and Click **OK** to view the message. |
| 13 | **Apply Template:**<br>• Click on the **Centralized Monitor** tab, then right click on the **host** and click **Select Global Template**.<br>• Select the template you just created. Click OK.<br>• Click on the **Centralized Monitor** server. The template should appear under the **Templates in Use** tab.<br>• Click the **Monitor System** button and select your VNX.<br>• Once selected, verify it appears under the Monitored Systems/Local Templates tab in the Details window.<br>• Close Unisphere |

*End of Lab Exercise 13*

# Lab Exercise 14: SnapView Snapshots

| | |
|---|---|
| **Purpose:** | To ensure that the environment is configured correctly for SnapView.<br><br>You will be working with your **Windows Physical host (SAN-X** where **X** is your team number) for this lab. This host will be referred to as the **Primary** host.<br><br>You will also be working with your **Windows VM host** (**Win-X** where **X** is your team number) for this lab. This host will be referred to as the **Secondary** host. |

| | |
|---|---|
| **Tasks:** | Students perform the following tasks:<br><br>• Verify that SnapView is enabled on the VNX<br>• Verify that the required LUNs and Storage Groups are present on the VNX<br>• Allocate LUNs to the Reserve LUN Pool<br>• Create and Test a SnapView snapshot<br>• Test Snapview session persistence<br>• Rollback a SnapView session<br>• Start and test a consistent Snapview session<br>• Test the Reserved LUN Pool |

| | |
|---|---|
| **References:** | VNX Implementation Student Guide |



EMC² where information lives®

This page intentionally left blank.



EMC²
where information lives®

# Lab 14: Part 1 – Allocate LUNs to the Reserved LUN Pool with EMC Unisphere

| Step | Action |
|---|---|
| 1 | **System Login:**<br>• Login to Unisphere from your Windows workstation with your sysadmin account credential.<br>• From the Dashboard, select your **VNX** from the All System dropdown lists and click the **System** button on the Navigation Bar. |
| 2 | **Verify SnapView is licensed:**<br>• From the **System Management** menu on the right side of the screen, select **System Properties**. Click the **Software** tab.<br>• The dialog displays a list of the licensed products. Verify that the following entry appears (note the dash in front of the name):<br>  ○ -SnapView<br>• If the entry is present, then the VNX Replication Software is ready to be used. If the entry is not present, consult the instructor.<br>• Click **Cancel** |
| 3 | **Create LUNs:**<br>• Navigate to **Storage > LUNs > LUNs** and click the **Create** button.<br>• Select the **RAID Group** radio button and enter the following configuration:<br>  ○ RAID Type: **RAID 5**<br>  ○ Storage Pools for New LUN: **5**<br>  ○ User Capacity: **5GB**<br>  ○ LUN ID = **100**<br>  ○ Number of LUNs to Create: **4**<br>  ○ Click Name and type in **RLP**<br>  ○ Starting ID: **100**<br>• Click Apply, Yes, OK. Once completed click Cancel. |

| Step | Action |
|---|---|
| 4 | **Add LUNs to the Global Pool LUNs:**<br><br>• Navigate to **Data Protection > Reserved LUN Pool**.<br>• Click the **Allocated LUNs** tab click **Configure**.<br>• From the **Configure Reserved LUN Pool** window select the RLP LUNs you created - **RLP_100, RLP_101, RLP_102 and RLP_103** - and for each RLP LUN click the **Add LUN** button. This moves the LUNs from the **Available LUNs** column to the **Global Pool LUNs** column. Click Apply/Yes. After the Success message click OK and then click Cancel. |
| 5 | **View Free LUNs:**<br><br>• Click the **Free LUNs** tab next to the **Allocated LUNs** tab.<br>• The RLP LUNs are located here. Select **RLP_100** and click **Properties**.<br><br>Which LUN Folder contains the RLP LUNs? _____ |

*End of Lab Exercise 14 Part 1*

# Lab 14: Part 2 - Create a SnapView Snapshot with EMC Unisphere on Windows

| Step | Action |
|---|---|
| 1 | **Create LUNs:**<br>• In Unisphere, navigate to **Storage > LUNs > LUNs**.<br>• Click the **Create** button.<br>• Select the RAID Group radio button and enter the following configuration:<br>  ○ RAID Type: **RAID 5**<br>  ○ Storage Pools for New LUN: **5**<br>  ○ User Capacity: **5GB**<br>  ○ LUN ID = **105**<br>  ○ Number of LUNs to Create: **4**<br>  ○ Click Name and type in **S_LUN**<br>  ○ Starting ID: **105**<br>• Click Apply, Yes, OK. |
| 2 | **Add LUN to a Storage Group:**<br>• Navigate to **Host >Storage Groups.**<br>• Select your **TeamX_Win-X** (where **X** is your team number) storage group and click **Connect LUNs**.<br>• Expand the **SPA** and **SPB** containers and select **S_LUN_105** and click **Add**. Then click **OK, Yes, OK.** |
| 3 | **Navigate to the Disk Management menu on your Windows Workstation:**<br>• On your **Windows Physical primary host (SAN-X** where **X** is your team number), click **Start** and right-click **Computer**. Select **Manage**.<br>• From the **Server Manager** window, expand the **Storage** container and select **Disk Management**.<br>• An Initialize Disk menu will launch. |
| 4 | **Initialize Disk:**<br>• From the **Initialize Disk** menu screen make sure the new disks is **checked** and that the **MBR (Master Boot Record)** is selected. Click OK.<br>• This will initialize the disk. The disk will now be shown as a Basic disk that is unallocated. |

| Step | Action |
|---|---|
| 5 | **Create New Simple Volumes for the new disk:**<br><br>• For the **unallocated disk** do the following steps:<br>  ○ Right click the **unallocated** section next to a disk and select **Create New Simple Volume.**<br>  ○ The **New Simple Volume Wizard** will appear. Click Next.<br>  ○ For the **Specify Volume Size** make sure the **Simple volume size in MB** matches the **Maximum disk space in MB** amount and click Next.<br>  ○ For **Assign the following drive letter** use the **default** and click Next.<br>  ○ For **Format Partition** use the defaults and click Next.<br>  ○ Review your configuration and click **Finish**.<br><br>What is the drive letter for the new simple volume you just created?_____<br><br>• Close Server Manager |
| 6 | **Renaming a Volume:**<br><br>• On your **Windows Physical primary host (SAN-X** where **X** is your team number) click **Start > Computer**.<br>• Select the new volume you just created, right click it and click **Rename**.<br>• Name it **TX_S_LUN_105** (where **X** is your team number). |
| 7 | **Create a text file:**<br><br>• Open your **TX_S_LUN_105** drive, right click the empty space and select **New > Text Document**.<br>• Name the file **S_LUN_105.txt**.<br>• Open **S_LUN_105.txt** and add some text into the file, such as your **team number**, **date** and **time** and save it. |
| 8 | **Create Snapshot:**<br><br>• In Unisphere, navigate to **Storage > LUNs > LUNs**.<br>• From the LUNs menu, right click **S_LUN_105** and select **SnapView > Create Snapshot**.<br>• Name the Snapshot **TX_Snapshot_105** (where **X** is your team number).<br>• Do **not** assign the Snapshot to a Storage Group.<br>• Click **OK, Yes, OK**. |
| 9 | **View Snapshots Source LUNs:**<br><br>• Navigate to **Data Protection > Snapshots > LUN Snapshots**.<br>• Click the **Source LUNs** tab. You should see **S_LUN_105**.<br>• Select **S_LUN_105**. In the bottom window under **Snapshot Details** you should see that the state of **TX_Snapshot_105** is **Inactive**. |

| Step | Action |
|---|---|
| 10 | **Start a SnapView Session:**<br><br>• Right-click **S_LUN_105** and select **SnapView > Start SnapView Session**<br>• Name the session: **Session_105**.<br>• Leave all other parameters as their defaults.<br>• Click OK, Yes, OK.<br>• Click the **Session** tab. **Session_105** should be present. |
| 11 | **Activate a Snapshot:**<br><br>• Click the **Snapshot LUNs** tab and select **TX_Snapshot_105**. Click **Activate**.<br>• From the Available Snapshot Sessions select **Session_105** and click OK, Yes, OK.<br>• Navigate to **Data Protection > Reserved LUN Pool**. Under the Allocated LUNs tab expand **S_LUN_105.**<br><br>What is in the **S_LUN_105** container? _____<br><br>• Select **RLP_100** and click Properties.<br><br>What is the current Usage? _____<br><br>• Click OK. |
| 12 | **Delete a text file:**<br><br>• On your **Windows Physical primary host (SAN-X** where **X** is your team number) click **Start > Computer**.<br>• Open the **TX_S_LUN_105** (where **X** is your team number) drive<br>• Delete the **S_LUN_105.txt** file you previously created. |
| 13 | **Verify you have a Storage Group for your Windows VM secondary host:**<br><br>• Locate the WinVM Storage group you created earlier in these labs, highlight it and choose **Properties**<br>• Confirm the Storage Group name is **TeamX_WinVM** (where X is your team number) and click **OK.**<br>• If needed then rename the Storage Group to the naming convention shown above and click OK, else go to step 14. (Our labs will speak to this naming convention.)<br>• *If you needed to rename it* then a message will ask you "**This operation will change the storage group name to "TeamX_WinVM"**, click **Yes and OK**. |

| Step | Action |
|---|---|
| 14 | **Verify the Windows VM Group has your Windows VM secondary host:**<br>• From the Storage Group properties window select the Click the **Hosts** tab.<br>• Verify your **Windows VM secondary host** (**Win-X** where **X** is your team number) is in the **Hosts to be Connected** pane.<br>• Once verified Click **OK. (This host should still be there from the earlier labs)** |
| 15 | **Add a Snapshot to your Secondary Windows Host Storage Group:**<br>• From the Storage Group window select your **TeamX_WinVM** storage group and click **Properties.** Select the **LUNs** tab.<br>• Expand the **Snapshots** container, select **Snapshot_105** and click **Add**. Then click **OK/Yes/OK**. |
| 16 | **Login to your Secondary Windows workstation and verify Snapshot:**<br>• Login to your **Windows VM secondary host** (**Win-X** where **X** is your team number). See Appendix for login information.<br>• Click **Start** and double-click **Computer**. You should see the **TX_S_LUN_105** drive you created previously.<br>  ○ If you **do not** see the **TX_S_LUN_105** drive, right-click **Computer** and select **Manage**. Expand the **Storage** container and select **Disk Management**.<br>  ○ From the **Disk Management** window select **More Actions** and click **Rescan Disks.** When the scan is complete, return to **Computer** and the **TX_S_LUN_105** drive is present.<br>• Open the **TX_S_LUN_105** drive. You should see the **S_LUN_105.txt** file you deleted on your primary Windows host. |
| 17 | **Create a text file on the Snapshot:**<br>**Create a text file:**<br>• In your **TX_S_LUN_105** (Snapshot) drive, right click the empty space and select **New > Text Document**.<br>• Name the file **TX_Snapshot_file**(where **X** is your team number).<br>• Open **TX_Snapshot_file.txt** and add some text into the file, such as your **team number**, **date** and **time** and save it. |
| 18 | **Login to your Primary Windows Workstation:**<br>• If needed then login to your **Windows Physical primary host (SAN-X** where **X** is your team number), click **Start** and double click **Computer.**<br>• Open the **TX_S_LUN_105** drive. The text file that was created on the Snapshot is not present on the Source LUN. |

*End of Lab Exercise 14 Part 2*



EMC² where information lives®

| Step | Action |
|---|---|
| 1 | **Trespass LUNs:**<br>• In Unisphere, navigate to **Data Protection > Snapshots > LUN Snapshots**. Then click the **Source LUNs** tab.<br>• Right-click **S_LUN_105**, and choose **Trespass**. Click Yes, OK. |
| 2 | **Verify Trespass:**<br>• Click the refresh icon in the upper right hand corner of the pane.<br>• Click the **Sessions** tab and verify the state of the Session_105.<br>Did Session_105 survive the trespass? Why or why not? _____ |
| 3 | **View SP Event Logs:**<br>• Navigate to **System > Monitoring and Alerts > SP Event Logs** and select **Show SPA Event Log**.<br>Does the SP event log have a record for the trespass? _____<br>• Click **Cancel.** |

*End of Lab Exercise 14 Part 3*



EMC² where information lives®

# Lab 14: Part 4 - Test the SnapView Rollback Feature with EMC Unisphere

| Step | Action |
|---|---|
| 1 | **Create a new Snapview Session:**<br><br>• In Unisphere, navigate to **Data Protection > Snapshots > LUN Snapshots**. Then click the **Source LUNs** tab.<br>• Right-click **S_LUN_105** and click **Snapview > Start Snapview Session**. Name the new session **Session_105_1** and click **OK, Yes, OK**.<br>• From the **Source LUNs** tab, expand **S_LUN_105**. It should now be populated with two sessions:<br>  ○ Session_105_1<br>  ○ Session_105 (previously created) |
| 2 | **Create a text file on your primary Windows Host:**<br><br>• From your **Windows Physical primary host (SAN-X** where **X** is your team number), click **Start** and double click **Computer.**<br>• Open your **TX_S_LUN_105** drive, right click the empty space and select **New > Text Document**.<br>• Name the file **Session_105_1.txt**<br>• Open **Session_105_1.txt** and add some text into the file, such as your **team number**, **date** and **time** and save it. |
| 3 | **Using Admsnap:**<br><br>• Open a **command prompt** on your Primary **Windows workstation**. Make sure the starting directory is **C:**<br>  ○ If it is not type the command **cd ..** until the directory is **C:**.<br>• Change directories to Admsnap by typing the following:<br>  ○ **cd \Program Files <x86>\EMC\ServerUtility**<br>• Then type the following command:<br>  ○ **admsnap_win2k.exe clone_deactivate –o** < **TX_S_LUN_105 drive letter**>:<br>• The command should look something like this when finished:<br><br>\Program Files <x86>\EMC\ServerUtility\admsnap_win2k.exe clone_deactivate –o M: |
| 4 | **Rollback Session:**<br><br>• In Unisphere, click the **Source LUNs** tab. Select **Session_105** and select **Rollback**.<br>• Under **SnapView Recovery Session**, **check** the **Start Session** box and for **Session Name** type **Sess_105_R**. For the **Rollback Rate** select **High.** Click OK, Yes, Yes, OK. |



EMC² where information lives®

| Step | Action |
|---|---|
| 5 | **Re-activate the Source LUN:**<br><br>• Open a **command prompt** on your Primary **Windows workstation**.<br>• Change directories to Admsnap by typing the following:<br>  ○ **cd \Program Files <x86>\EMC\ServerUtility**<br>• Then type the following command:<br>  ○ **admsnap_win2k.exe clone_activate**<br>• The command should look something like this when finished:<br><br>\Program Files <x86>\EMC\ServerUtility\admsnap_win2k.exe admsnap clone_activate<br><br>• Wait for the Rollback process to complete. |
| 6 | **Verify Rollback Process:**<br><br>• On your **Windows workstation**, click **Start** and right-click **Computer**. Select **Manage**.<br>• From the **Server Manager** window, expand the **Storage** container and select **Disk Management**.<br>• Select **More Actions** from the right side menu and click **Rescan Disks.**<br>• Click **Start** and double-click **Computer**. Open the **TX_S_LUN_105** drive. The **Session_105_1.txt** should not be present. |

*End of Lab Exercise 14 Part 4*

# Lab 14: Part 5 - Start and Test a Consistent SnapView Session with EMC Unisphere

| Step | Action |
|---|---|
| 1 | **Create a new Snapshot (106):**<br>• In Unisphere, navigate to **Storage > LUNs > LUNs**.<br>• From the LUNs menu, right click **S_LUN_106** and select **SnapView > Create Snapshot**.<br>• Name the Snapshot **TX_Snapshot_106** (where **X** is your team number).<br>• Do **not** assign the Snapshot to a Storage Group.<br>• Click **OK, Yes, OK**. |
| 2 | **Create a new Snapshot (107):**<br>• From the LUNs menu, right click **S_LUN_107** and select **SnapView > Create Snapshot**.<br>• Name the Snapshot **TX_Snapshot_107** (where **X** is your team number).<br>• Do **not** assign the Snapshot to a Storage Group.<br>• Click **OK, Yes, OK**. |
| 3 | **Make a Consistent session:**<br>• Navigate to **Data Protection > Snapshots > Source Snapshots** and click the **Source LUNs** tab.<br>• Right-click **S_LUN_106** and select **SnapView > Start SnapView Session**.<br>• Name the session **Consistent_S** and check the **Consistent** checkbox.<br>• Expand container **SPA** and select **S_LUN_107** and click **Add**. Then click OK, Yes, OK. |
| 4 | **Activate Snapshot (106):**<br>• Click the **Snapshot LUNs** tab. Select **TX_Snapshot_106** (where **X** is your team number) and click **Activate**.<br>• From the **Available Sessions** pane select **Consistent_S** and click OK, Yes, OK. |
| 5 | **Activate Snapshot (107):**<br>• Click the **Snapshot LUNs** tab. Select **TX_Snapshot_107** (where **X** is your team number) and click **Activate**.<br>• From the **Available Sessions** select **Consistent_S** and click OK, Yes, OK. |
| 6 | **Verify Consistent Session:**<br>• Click the **Sessions** tab.<br>• Select the **Consistent_S** session and click Properties.<br>• Verify the Mode(s) are Persistent, Consistent.<br>• In the Member LUNs list, verify that Source LUNs **S_LUN_106** and **S_LUN_107** are present. Click **OK.** |

*End of Lab Exercise 14 Part 5*



EMC² where information lives®

# Lab 14: Part 6 - Test the Operation of the Reserved LUN Pool with EMC Unisphere on Windows

| Step | Action |
|---|---|
| 1 | **Create a Template:**<br><br>• In Unisphere, navigate to **System> Monitoring and Alerts > Notification for Block**.<br>• From the **Configure** tab select **Create Template**.<br>• Name the template **VNX_Template** and **check all** the **Event Severity** and **Event Category** boxes. Click **OK, OK.**<br>• Click the **Distributed Monitors** tab.<br>• Select **SPA** and click **Use Template**. Select the **VNX Template** and click **OK**.<br>• Select **SPB** and click **Use Template**. Select the **VNX Template** and click **OK**.<br><br>The template should allow logging of warnings and should log events to your Windows host. |
| 2 | **Remove Free RLP LUNs:**<br><br>• Navigate to **Data Protection > Reserved LUN Pool**.<br>• Click the **Free LUNs** tab and click **Configure**.<br>• Select any **Free** RLP LUNs from the **Global Pool LUNs** category and click **Remove LUN**. Click OK, Yes, OK. |
| 3 | **Clear Windows System Log Files and Application Log Files**:<br><br>• On your Windows workstation, click **Start**, right-click **Computer** and select **Manage**.<br>• Expand the **Diagnostics** container and then expand the **Event Viewer** container. Expand the **Windows Logs** container and click **System** log. The logs are now visible.<br>• From the **Actions** menu select **Clear Log** and select **Clear**.<br>• Click **Application** log. From the **Actions** menu select **Clear Log** and select **Clear**. |
| 4 | **Add LUNs to a Storage Group:**<br><br>• Navigate to **Host >Storage Groups.**<br>• Select your **TeamX_Win-X** (where **X** is your team number) storage group and click **Connect LUNs**.<br>• Expand the **SPA** and **SPB** containers and select **S_LUN_106** and **S_LUN_107** and click **Add**.<br>• Then click **OK, Yes, OK.** |
| | **Navigate to the Disk Management menu on your Windows Workstation:**<br><br>• On your **Windows workstation**, click **Start** and right-click **Computer**. Select **Manage**.<br>• From the **Server Manager** window, expand the **Storage** container and select **Disk Management**.<br>• An Initialize Disk menu will launch. |



EMC² where information lives®

| Step | Action |
|---|---|
| 5 | **Initialize Disks:**<br><br>• From the **Initialize Disk** menu screen make sure the new disks are **checked** and that the **MBR (Master Boot Record)** is selected. Click OK.<br>• This will initialize the disk. The disk will now be shown as a Basic disk that is unallocated. |
| 6 | **Create New Simple Volumes for the new disk:**<br><br>• For the two **unallocated disks** do the following steps:<br>  ○ Right click the **unallocated** section next to a disk and select **Create New Simple Volume.**<br>  ○ The **New Simple Volume Wizard** will appear. Click Next.<br>  ○ For the **Specify Volume Size** make sure the **Simple volume size in MB** matches the **Maximum disk space in MB** amount and click Next.<br>  ○ For **Assign the following drive letter** use the **default** and click Next.<br>  ○ For **Format Partition** use the defaults and click Next.<br>  ○ Review your configuration and click **Finish**.<br><br>What are the drive letter for the two new simple volume you just created?_____<br><br>• Close Server Manager |
| 7 | **Copy Files:**<br><br>• On your **Windows workstation** copy any random file into the **S_LUN_106** and **S_LUN_107** drives (the drives that you just created) until the drives are full. |
| 8 | **View Session Details:**<br><br>• When the **S_LUN_106 and S_LUN_107** drives are full, in Unisphere navigate to **Data Protection >Snapshots > LUN Snapshots** and click the **Sessions** tab.<br>• Select the **Consistent_S** session. Under **Session Details** the sessions should be gone.<br>• Navigate to **Data Protection > Reserved LUN Pool**. Check the Reserved LUN Pool. The Reserved LUNs previously assigned to **S_LUN_106** and **S_LUN_107** should indicate a **Free** status. |
| 9 | **View SPA Event Log:**<br><br>• Navigate to **Systems > Monitoring and Alerts > SP Event Logs**. Click **Show SPA Event Log**. Click Yes.<br>• At what percentages (%s) are the Reserved LUN Pool events posted?<br>_____ |



EMC² where information lives®

| Step | Action |
|---|---|
| 10 | **View logs:**<br>• On your **Windows Physical primary host (SAN-X** where **X** is your team number), right-click **Computer** and select **Manage**. Expand the **Diagnostics** container, expand the **Event Viewer** containers and expand the **Windows Logs**.<br>• View the **System** logs.<br>• View the **Application** Log (from the bottom up).<br>• What do you see in the host logs about SnapView Sessions and the Reserved LUN Pool?<br>_____ |

*End of Lab Exercise 14*

EMC²
where information lives®

# Lab Exercise 15: SnapView Clone

| | |
|---|---|
| **Purpose:** | To configure a VNX storage system for use with SnapView Clones by using EMC Unisphere<br><br>You will be working with your **Windows Physical host (SAN-X** where **X** is your team number) for this lab. This host will be referred to as the **Primary** host.<br><br>You will also be working with your **Windows VM host** (**Win-X** where **X** is your team number) for this lab. This host will be referred to as the **Secondary** host. |

| | |
|---|---|
| **Tasks:** | Students perform the following tasks:<br><br>• Allocate Clone Private LUNs and enable protected restore<br>• Create and test a Clone using Unisphere<br>• Perform a Clone consistent fracture |

| | |
|---|---|
| **References:** | VNX Implementation Student Guide |

# Lab 15: Part 1 – Allocate Clone Private LUNs and Enable Protected Restore

| Step | Action |
|---|---|
| 1 | **Create LUNs:**<br><br>• In Unisphere, from the Dashboard window, select your VNX from the All System dropdown lists. Navigate to **Storage > LUNs > LUNs** and click **Create**.<br>  ○ Select the **RAID Group** radio button and enter the following configuration:<br>  ○ RAID Type: **RAID 5**<br>  ○ Storage Pools for New LUN: **5**<br>  ○ User Capacity: **1 GB**<br>  ○ LUN ID = **200**<br>  ○ Number of LUNs to Create: **2**<br>  ○ Click Name and type in **CPL**<br>  ○ Starting ID: **200**<br>• Click Apply, Yes, OK, Cancel. |
| 2 | **Configure Clone Settings:**<br><br>• Navigate to **Data Protection > Clones**.<br>• From the **Protection** menu on the right side of the screen, select **Configure Clone Settings**.<br>• From the **Available LUNs** window, expand the **SPA** and **SPB** containers. Select LUNs **CPL_200** and **CPL_201** and click **Add**.<br>• Check **Allow Protected Restore**.<br>• Click OK, Yes, OK. This will make them Clone Private LUNs.<br><br>Why don't you have to specify which SP will use a given CPL? _____<br><br>Were any thin LUNS available for selection? _____<br><br>VNX is now configured to allow the use of SnapView Clones and the Protected Restore feature. |

*End of Lab Exercise 15 Part 1*



EMC² where information lives®

| Step | |
|---|---|
| 1 | **Create LUNs:**<br>• Navigate to **Storage > LUNs > LUNs** and Click **Create**.<br>• Select the Pool radio button and enter the following configuration:<br>  ○ RAID Type: **RAID 5**<br>  ○ Storage Pools for New LUN: **Pool 0**<br>  ○ **Check Thin**<br>  ○ User Capacity: **10GB**<br>  ○ LUN ID = **125**<br>  ○ Number of LUNs to Create: **1**<br>  ○ Click Name and type in **Clone_TeamX** (where **X** is your team number).<br>• Click Apply, Yes, OK, Cancel. |
| 2 | **Create a Clone Group:**<br>• Navigate to **Data Protection > Clones**.<br>• From the **Protection** menu on the right side of the screen, select **Create Clone Group**.<br>• Name the Clone Group **Clone_GroupX** (where **X** is your team number).<br>• From the **LUNS to be Cloned** window, expand the SPA container and select **T0_LUN_0**. Click Apply, Yes, OK, Cancel.<br>• The selected LUN will appear under the Source LUN and Clone LUN tabs. |
| 3 | **Add a Clone:**<br>• Select **T0_LUN_0** and select **Add Clone**.<br>• Expand each of the SP and Thin LUN containers to view a list of available LUNs (remember only LUNS of the same size are eligible).<br>• Select **Clone_TeamX** (where **X** is your team number) and apply the following parameters:<br>  ○ Check the Use Protected Restore checkbox.<br>  ○ Recovery Policy: **Automatic**<br>  ○ Synchronization Rate: **High**<br>• Click Apply, Yes, Yes, OK, Cancel. |
| 4 | **Clone Properties:**<br>• Click the **Clone LUNs** tab.<br>• Select **Clone_TeamX** and click Properties.<br>Note the Clone ID _____<br>• Click **Cancel.** |



EMC² where information lives®

| Step | |
|---|---|
| 5 | **Flush the host buffers:**<br>• On your **Windows Physical primary host (SAN-X** where **X** is your team number), click **Start** and open a **Command Prompt**.<br>• Make sure the starting directory is **C:**<br>  ○ If it is not type the command **cd ..** until the directory is **C:**.<br>• Change directories to Admsnap to by typing the following:<br>  ○ **cd \Program Files <x86>\EMC\ServerUtility**<br>• Flush the Source LUN host buffers by typing the following command:<br>  ○ admsnap_win2k8 flush –o <drive letter>:<br>  ▪ The drive letter is the drive of **T0_LUN_0.** This can be found in the **Storage > LUNs > LUNs** menu.<br>• The command should look similar to the following command.<br>  ○ admsnap_win2k8.exe flush –o E: |
| 6 | **Fracture Clone:**<br>• In Unisphere, from the **Clone LUNs** tab, select **Clone_TeamX** and click **Fracture, Yes, OK**.<br>  ○ The Clone state will change to Consistent.<br>• Select **Clone_TeamX** and click Properties.<br>What is displayed after “Is Fractured”? _____<br>• Click **Cancel** |
| 7 | **Add a Clone to a Storage Group:**<br>• Navigate to **Host >Storage Groups.**<br>• Select your **TeamX_Win-X** (where **X** is your team number) storage group and click **Connect LUNs**.<br>• Expand the **SPA** and **SPB** containers and select **Clone_TeamX** and click **Add**.<br>• Then click **OK, Yes, OK.** |
| 8 | **Activate Clone:**<br>• On your **Windows Physical primary host** (**SAN-X** where **X** is your team number), right click **Computer** and select **Manage**.<br>• From the **Server Manager** window, expand the **Storage** container and select **Disk Management**. Select **More Actions** from the right side of the window and click **Rescan Disks**.<br>• On the Clone drive, create a new file named **TeamX_Clone.txt** (where **X** is your team number). Add some text into the file, such as your team number, date and time. |

| Step | |
|---|---|
| 9 | **Deactivate the Clone:**<br>• On your **Windows Physical primary host** (**SAN-X** where **X** is your team number), click **Start** and open a **Command Prompt**.<br>• Make sure the starting directory is **C:**<br>  ○ If it is not type the command **cd ..** until the directory is **C:**.<br>• Change directories to Admsnap to by typing the following:<br>  ○ **cd \Program Files <x86>\EMC\ServerUtility**<br>• Flush the Source LUN host buffers by typing the following command:<br>  ○ admsnap_win2k8 flush –o <drive letter>:<br>  ▪ The drive letter is the drive of **T0_LUN_0.** This can be found in the **Storage > LUNs > LUNs** menu.<br>• Deactivate the Clone with admsnap:<br>  ○ admsnap_win2k8 clone_deactivate –o <drive letter>: |
| 10 | **Reverse Synchronize the Clone:**<br>• In Unisphere, navigate to **Data Protection > Clone**.<br>• Then click the **Clone LUNs** tab.<br>• Select **Clone_TeamX** and click **Reverse Synchronize**. |
| 11 | **Rescan Disks**:<br>• On your **Windows Physical primary host (SAN-X** where **X** is your team number), right click **Computer** and select **Manage**.<br>• From the **Server Manager** window, expand the **Storage** container and select **Disk Management**. Select **More Actions** from the right side of the window and click **Rescan Disks**. |
| 12 | **Verify Data:**<br>• On your **Windows Physical primary host (SAN-X** where **X** is your team number), double click **Computer** and open the **T0_LUN_0** drive.<br>• Verify that the data on the Source LUN is identical to that on the Clone. |

*End of Lab Exercise 15 Part 2*

# Lab 15: Part 3 – Perform a Clone Consistent Fracture

| Step | Action |
|---|---|
| 1 | **Create a new Clone:**<br>• In Unisphere, navigate to **Data Protection > Clones** and click the **Source LUNs** tab.<br>• Create one new Clone from **T0_LUN_0**.<br>• Right-click **T0_LUN_0** and select **Add Clone**.<br>  ○ Expand **SPA** and **SPB** and select LUN **T1_LUN_4**.<br>  ○ Check the Use Protected Restore checkbox.<br>  ○ Recovery Policy: **Automatic**<br>  ○ Synchronization Rate: **High**<br>• Click Apply, Yes, OK.<br>• Then click Cancel to exit the dialog. |
| 2 | **Create a Clone Group:**<br>• Navigate to **Data Protection > Clones**.<br>• From the **Protection** menu on the right side of the screen, select **Create Clone Group**.<br>• Name the Clone Group **Clone_GroupX_2** (where **X** is your team number).<br>• From the **LUNS to be Cloned** window, expand the SPA container and select **RG5_LUN_52.** Click Apply, Yes, OK, Cancel.<br>• The selected LUN will appear under the Source LUN and Clone LUN tabs. |
| 3 | **Add a Clone:**<br>• Select **RG5_LUN_52** and select **Add Clone**.<br>• Expand each of the SP and Thin LUN containers to view a list of available LUNs (remember only LUNS of the same size are eligible).<br>• Select **RG5_LUN_55** and apply the following parameters:<br>  ○ Check the Use Protected Restore checkbox.<br>  ○ Recovery Policy: **Automatic**<br>  ○ Synchronization Rate: **High**<br>• Click Apply, Yes, OK, Cancel. |
| 4 | **Consistently Fracture two Clones:**<br>• Click the **Clone LUNs** tab. Once the Clones have finished Synchronizing hold the Control key and highlight the new clones.<br>• Click **Fracture, Yes, OK** to complete the fracture of the Clones. |

*End of Lab Exercise 15*



EMC² where information lives®

# Lab Exercise 16: VNX SnapSure

| | |
|---|---|
| **Purpose:** | In this lab, you configure SnapSure and observe some of its functions. You also perform various SnapSure management functions such as recovering files and restoring file systems.<br><br>You will be working with your **WIN-X VM Host** and **Linux-X VM Host** (where **X** is your team number) for this lab. |

| | |
|---|---|
| **Tasks:** | In this lab exercise, you will perform the following tasks:<br><br>• Configure SnapSure<br>• Create a writeable snapshot<br>• Manipulate data in a writeable snapshot<br>• Restore from a snapshot and writeable snapshot |

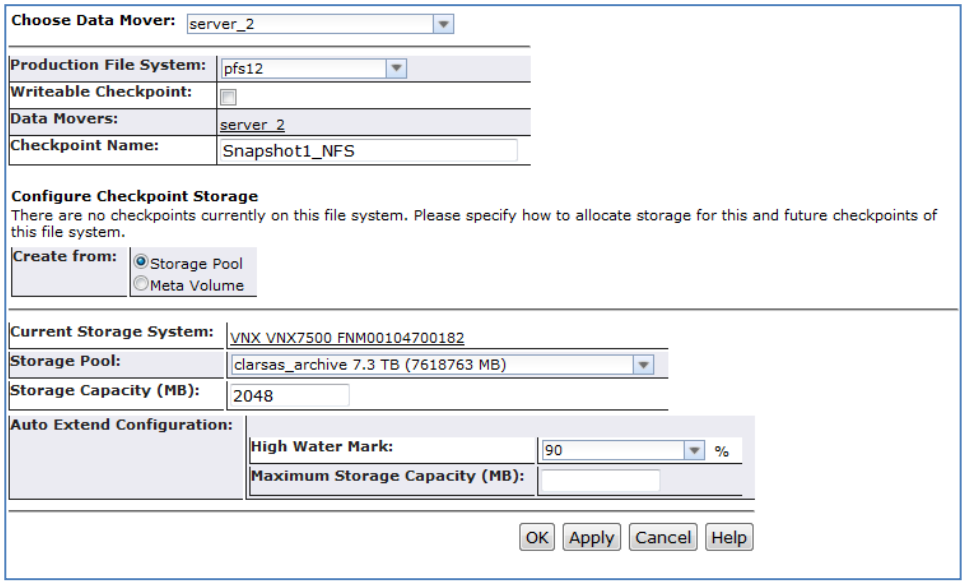


EMC² where information lives®

# Lab 16: Part 1 – Configuring SnapSure

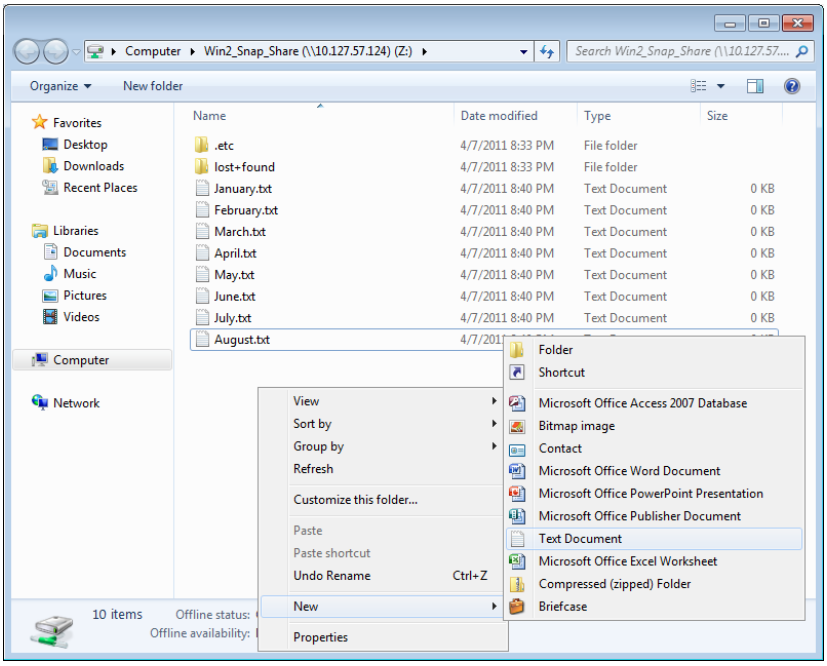
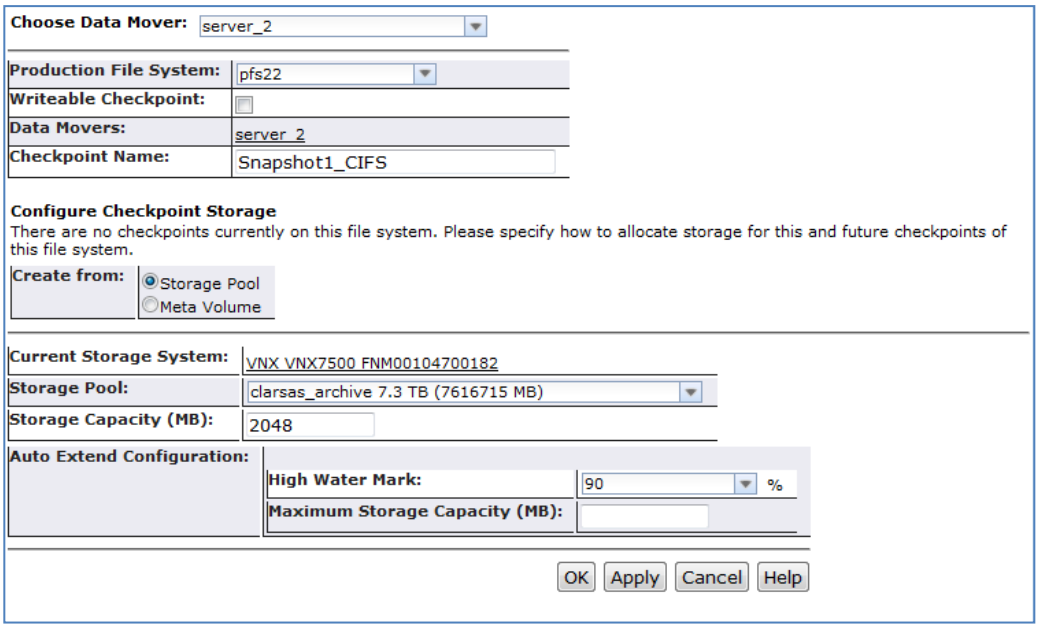
| Step | Action |
|---|---|
| 1 | **Create and export a file system for NFS:**<br>• Using Unisphere, create a new 2 GB file system using the clarsas_archive storage pool and name it pfs1X (where X is your team's number). Keep all defaults.<br>• Create an NFS export from the file system created using the default path. Assign *root* access to your Linux host. |
| 2 | **Create user data:**<br>• While logged in to your Linux workstation as *root*, mount the NFS export to the /studentX directory (where X is your team number). If this directory does not exist on your Linux workstation, and create one with the mkdir command.<br>`# mount <DM IP address>:/pfs1X /studentX`<br>• Change directory into the /studentX directory and run each of the following commands once:<br>`dd if=/dev/zero of=Monday bs=256 count=10`<br>`dd if=/dev/zero of=Tuesday bs=256 count=10`<br>`dd if=/dev/zero of=Wednesday bs=256 count=10`<br>`dd if=/dev/zero of=Thursday bs=256 count=10`<br>`dd if=/dev/zero of=Friday bs=256 count=10`<br>• Verify that you now have 6 files in the directory: one named lost+found and one file for each weekday. |


EMC² where information lives®

| Step | Action |
|---|---|
| 3 | **Create a new Snapshot:**<br><br>• In Unisphere, navigate to **Data Protection > Snapshots > Create**.<br>• Create a new snapshot with the following settings:<br><br>Choose Data Mover: **server_2**<br>Production File System: **pfs1X** (where X is your team number)<br>Writeable Checkpoint: **Unchecked**<br>Checkpoint Name: **Snapshot1_NFS**<br>Leave all other settings at **default**<br><br>  <br><br><br>• On your Linux client, change directory into /studentX/.ckpt<br><br>`# cd /studentX/.ckpt`<br><br>• View the directory contents by using the ls command. Write the results here.<br><br>_____<br><br>Note that the snapshot name assigned in Unisphere is not the same as this directory name. |
| 4 | **Create and share a file system for CIFS:**<br><br>• Create a 2 GB file system on server_2 by the name of **pfs2X** (where X is your team number). Use the available storage pool and keep all of the default settings.<br>• Create a share using the pfs2X file system by the name of **WinX_Snap_Share** (where X is your team's number) on your **VNX#_DM2** CIFS server. |

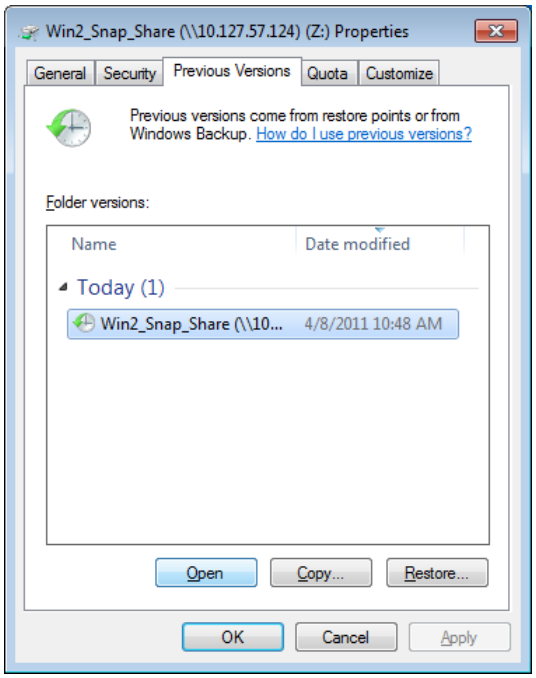


EMC² where information lives®

| Step | Action |
|---|---|
| 5 | **Create user data:**<br>• Map the new CIFS Share to your team's **Windows Physical primary host (SAN-X** where **X** is your team number).<br>• Create 12 new text files and name them for the months of the year (January to December).<br>  |
| 6 | **Create a Snapshot:**<br>• Create a new snapshot of pfs2X and name it Snapshot1_CIFS.<br>  |



EMC² where information lives®

| Step | Action |
|---|---|
| 7 | **Verify Snapshot creation:**<br><br>• On your team's **Windows Physical primary host (SAN-X** where **X** is your team number), open an explorer window and navigate to the **Computer** directory.<br>• Right-click your share and select **Properties**.<br>• Click on the **Previous Versions** tab (this is the Shadow Copy Client).<br><br>  <br><br><br>Do you see the snapshot you just created? What is the name of this snapshot?<br><br>_____ |

*End of Lab Exercise 16 Part 1*

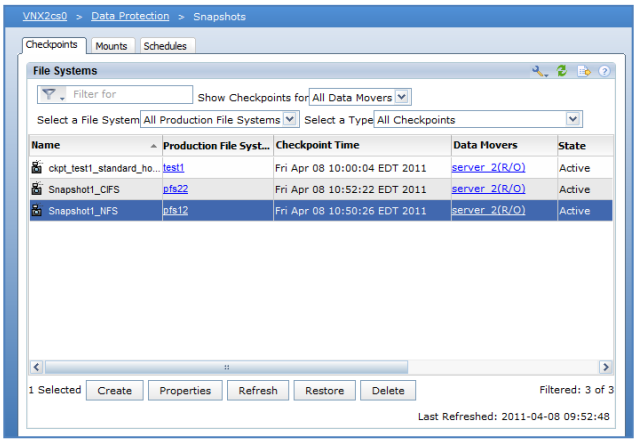


EMC² where information lives®

| Step | Action |
|---|---|
| 1 | **Delete user data:**<br>• On your Linux client, verify that the files created in the previous section of the lab are still present.<br>`# ls –l /studentX/.ckpt`<br>• Change directory to /studentX and remove the file named Tuesday.<br>• Verify that the file has been successfully deleted.<br>`# cd /studentX`<br>`# rm Tuesday`<br>`rm: remove regular file `Tuesday'? y`<br>`# ls -l`<br>`total 40`<br>`-rw-r--r-- 1 root root 2560 Apr 7 19:16 Friday`<br>`drwxr-xr-x 2 root root 8192 Apr 7 18:56 lost+found`<br>`-rw-r--r-- 1 root root 2560 Apr 7 19:10 Monday`<br>`-rw-r--r-- 1 root root 2560 Apr 7 19:11 Thursday`<br>`-rw-r--r-- 1 root root 2560 Apr 7 19:11 Wednesday`<br>• Change directory to **/studentX/.ckpt/<snapshot name>**.<br>• Run the **ls** command. Do you see the file named Tuesday? If you do not, please inform your instructor. |

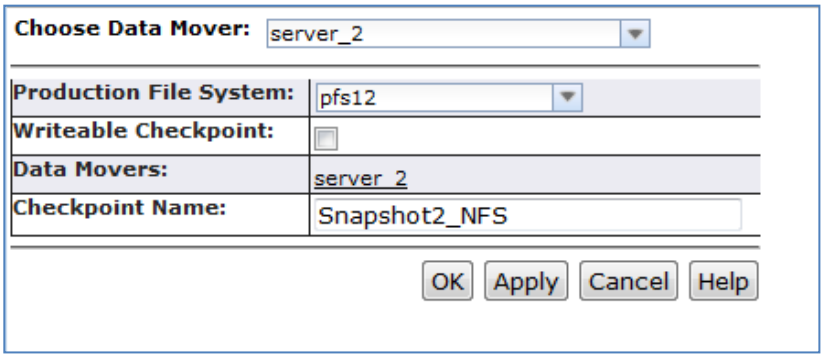


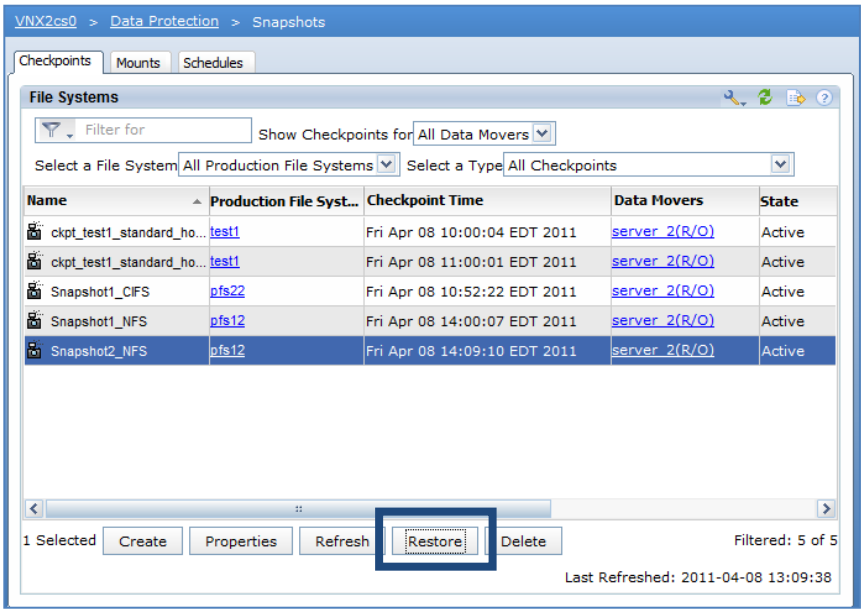
EMC² where information lives®

| Step | Action |
|---|---|
| 2 | **Recover a deleted file with Snapshots:**<br><br>• Recover the deleted file from the snapshot using **CVFS**. Use the following command to copy the file back to the original directory from the snapshot, then change directory back to /studentX and verify the file copied successfully.<br><br>**# cp Tuesday /studentX**<br><br>**# cd /studentX**<br><br>**# ls –l**<br><br>**total 48**<br><br>**-rw-r--r-- 1 root root 2560 Apr 7 19:16 Friday**<br><br>**drwxr-xr-x 2 root root 8192 Apr 7 18:56 lost+found**<br><br>**-rw-r--r-- 1 root root 2560 Apr 7 19:10 Monday**<br><br>**-rw-r--r-- 1 root root 2560 Apr 8 13:48 Tuesday**<br><br>**-rw-r--r-- 1 root root 2560 Apr 7 19:11 Wednesday**<br><br>You have just recovered an individual file from the point-in-time snapshot using CVFS. This leaves all other copies of files as they are currently. If any new files had been created after the snapshot, they are preserved. |
| 3 | **Refresh a Snapshot:**<br><br>• Create a new file in /studentX named Saturday.<br><br>`dd if=/dev/zero of=Saturday bs=256 count=10`<br><br>• In Unisphere, refresh the snapshot named **Snapshot1_NFS** by navigating to Data **Protection > Snapshots** and clicking the **Refresh** button.<br><br>  |



EMC² where information lives®

| Step | Action |
|---|---|
| 4 | **Verify that the new file has been preserved by the snapshot:**<br>• From your Linux workstation, enter the following command:<br>`# ls -la /studentX/.ckpt/<snapshot name>`<br>`total 73`<br>`drwxr-xr-x 5 root root 1024 Apr 8 13:56 .`<br>`dr-xr-xr-x 2 root root 512 Apr 8 13:57 ..`<br>`dr-xr-xr-x 2 root bin 1024 Apr 8 00:56 .etc`<br>`-rw-r--r-- 1 root root 2560 Apr 7 19:16 Friday`<br>`drwxr-xr-x 2 root root 8192 Apr 7 18:56 lost+found`<br>`-rw-r--r-- 1 root root 2560 Apr 7 19:10 Monday`<br>`-rw-r--r-- 1 root root 2560 Apr 8 13:56 Saturday`<br>`-rw-r--r-- 1 root root 2560 Apr 7 19:11 Thursday`<br>`-rw-r--r-- 1 root root 2560 Apr 8 13:48 Tuesday`<br>`-rw-r--r-- 1 root root 2560 Apr 7 19:11 Wednesday` |
| 5 | **Create a second Snapshot:**<br>• Create a new file in the /studentX directory named Sunday.<br>`dd if=/dev/zero of=Sunday bs=256 count=10`<br>• In Unisphere, create a new read-only snapshot named **Snapshot2_NFS** on pfs1X.<br>  |

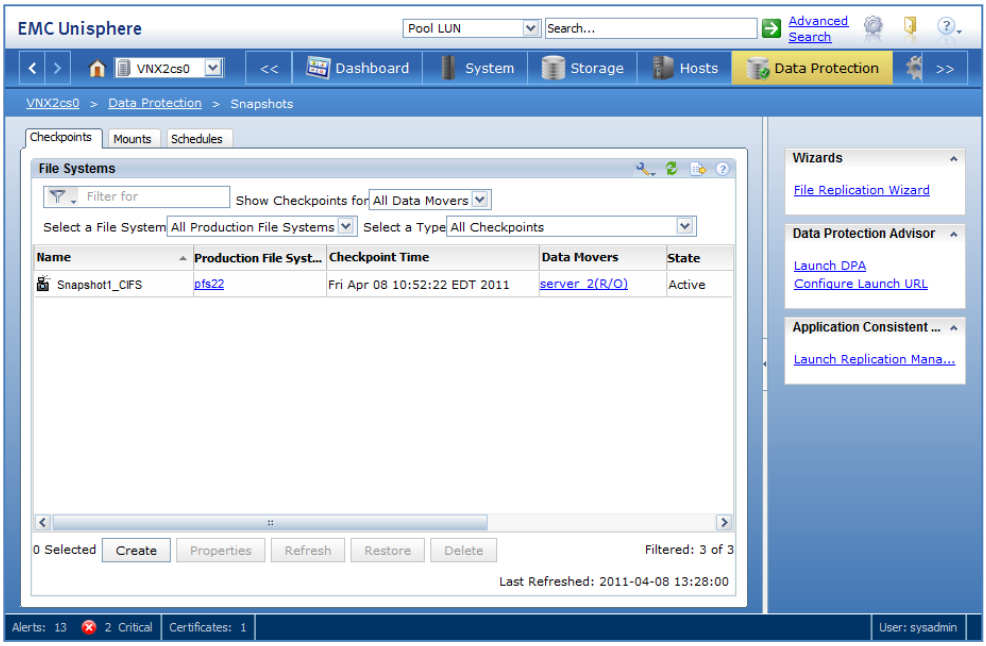
| Step | Action |
|---|---|
| | • On your Linux client, view the contents of /studentX/.ckpt. You should see a second snapshot directory.<br><br>`# ls -l /student2/.ckpt`<br><br>`total 16`<br><br>`drwxr-xr-x 5 root root 1024 Apr 8 13:56 2011_04_08_13.56.37_America_New_York`<br><br>`drwxr-xr-x 5 root root 1024 Apr 8 14:02 2011_04_08_14.05.39_America_New_York` |
| 6 | **Recover from a two file data loss:**<br><br>• Remove any two files from the /studentX directory and confirm they have been successfully removed.<br>• In Unisphere, select **Snapshot2_NFS** and click **Restore**. When prompted, enter the new snapshot name of **Snapshot2_NFS_Restore**.<br><br>  <br><br><br>• When the operation is complete, view the contents of the /studentX directory on your Linux client using the ls command.<br><br>Do you see a file for each day of the week? _____ |



EMC² where information lives®

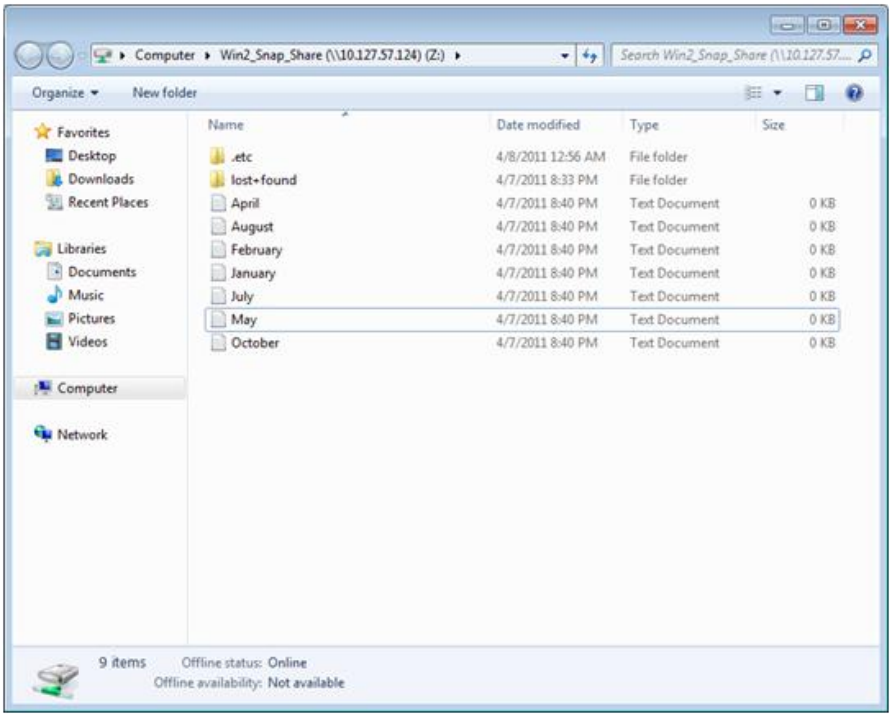
| Step | Action |
|---|---|
| | • In Unisphere, select **Snapshot1_NFS** and click **Restore**.<br>• When prompted, enter the new snapshot name of **Snapshot1_NFS_Restore**.<br>• When the operation is complete, view the contents of the /studentX directory on your Linux client using the ls command. You should see a file for Monday through Saturday.<br><br>Why is the Sunday file not there?<br><br>_____<br><br>_____<br><br>You have just performed a restore of a point-in-time copy of the file system. This reverts all files to a previous version and erases any files that were created after the snapshot, like the Sunday file. |
| 7 | **Lab cleanup:**<br><br>• On your Linux client, unmount the /studentX directory, then delete each of the NFS snapshots.<br>• Also delete the /pfs1X NFS export and the pfs1X file system.<br>• Leave pfs2X and each of the CIFS components for the next lab. |

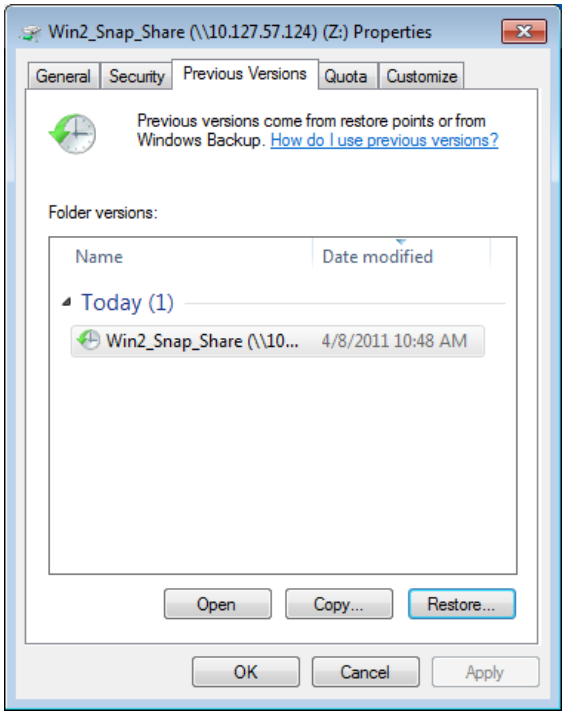
*End of Lab Exercise 16 Part 2*

| Step | Action |
|---|---|
| 1 | **Snapshot verification:**<br>• On your team's Windows workstation, verify that the CIFS share is still mapped and that there are 12 text files in the share named after each month of the year.<br>• In Unisphere, verify that there is a snapshot for **pfs2X** named **Snapshot1_CIFS**.<br>  |



EMC² where information lives®

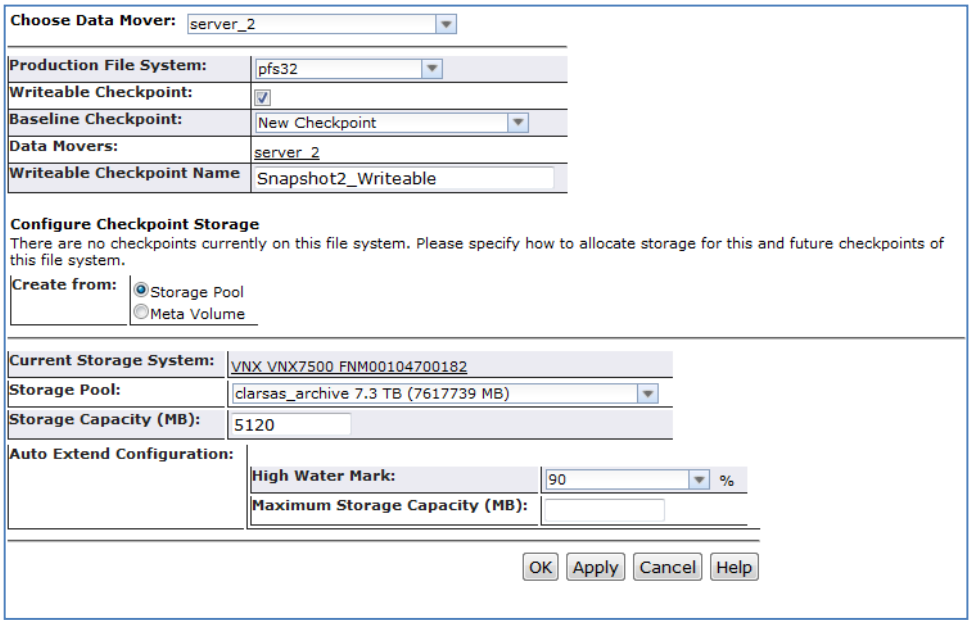
| Step | Action |
|---|---|
| 2 | **Delete user data:**<br><br>• Delete several files from the CIFS share.<br><br>  |
| 3 | **Restore from a Snapshot:**<br><br>• Open an explorer window and navigate to the **Computer** directory.<br>• Right-click on your CIFS share and select **Properties**.<br>• Select the **Previous Versions** tab, select the snapshot, and click **Restore**.<br>• At the confirmation screen, click **Restore** once again. Ignore if there is a warning message. |

| Step | Action |
|---|---|
| 4 |  <br><br>View the files in the CIFS share. Are there 12 text documents again? _____<br><br>You have just restored a file system from a point-in-time copy using Shadow Copy Client. This will erase any files that were created after the snapshot was created.<br><br>• Delete **January** and **February** from the CIFS share.<br>• From the CIFS share **Properties** window, select the snapshot and click **Open**.<br>• Select January and February and copy them back to the CIFS Share.<br><br>You have just restored individual files from a point-in-time copy using Shadow Copy Client. This allows all other files to remain in their current revision while recovering previous versions of specific files. |
| 5 | **Lab cleanup:**<br><br>• Disconnect the CIFS share from your Windows workstation.<br>• In Unisphere, delete the two Snapshots, CIFS share, and pfs2X file system.<br>• **DO NOT** delete the CIFS server (VNX2_DM) as you will use it in the next lab. |

*End of Lab Exercise 16 Part 3*

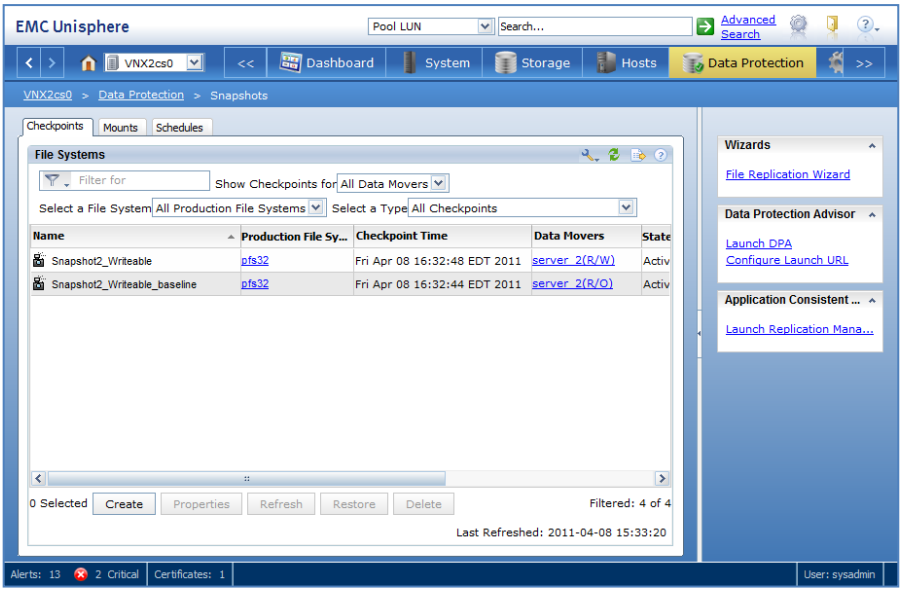


EMC² where information lives®

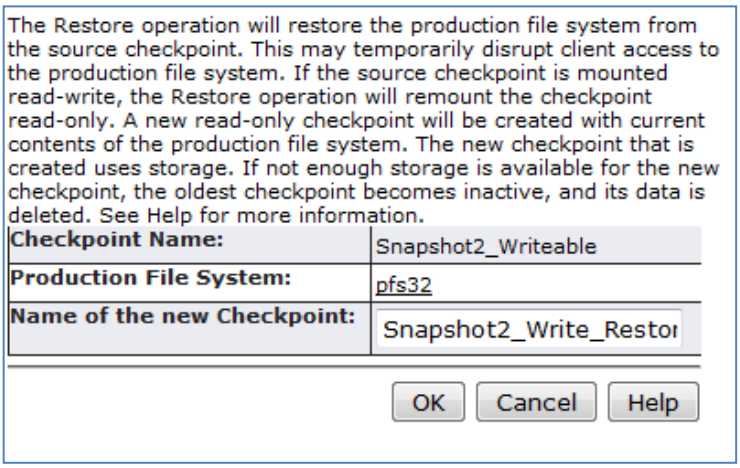
| Step | Action |
|---|---|
| 1 | **Create and share a file system for CIFS:**<br><br>• Using Unisphere, create a new 5GB (5120 MB) file system on server_2 using the available Storage Pool. Name the file system **pfs3X** (where X is your team number). Keep all default settings.<br>• Create a new CIFS share on the pfs3X file system and name it **ShareX** (where X is the number of your team.) Use the VNX#_DM2 server. |
| 2 | **Create writeable checkpoint:**<br><br>• On your team's **Windows Physical primary host (SAN-X** where **X** is your team number), map to the new CIFS share.<br>• Create five new text files and name them **Monday, Tuesday, Wednesday, Thursday, and Friday**.<br>• In Unisphere, create a new snapshot of pfs3X and name it **SnapshotX_Writeable**. Make sure to check the box that says **Writeable Checkpoint**. Leave all other fields at default options.<br><br>  |



EMC² where information lives®

| Step | Action |
|---|---|
| | Notice there are 2 snapshots created by one operation. The baseline snapshot is created automatically for each writeable snapshot unless an existing read-only snapshot is specified during writeable snapshot creation.<br>  |
| 3 | **Modify writeable Snapshot:**<br>• To access the writeable Snapshot for editing, you must create a CIFS share or NFS export and connect to it from the remote host. In Unisphere, create a CIFS share from the writeable snapshot named **SnapshotX_Writeable**. Use the VNX#_DM2 CIFS server.<br>• On your **Windows Physical primary host (SAN-X** where **X** is your team number), map the new CIFS share (**SnapshotX_Writeable**).<br><br>When the share opens, is it empty? Why or why not?<br>_____<br>• In the ShareX directory (the PFS), create two new files named Saturday and Sunday.<br>• In Unisphere, select the SnapshotX_Writeable snapshot.<br><br>Can you refresh the snapshot? Can you refresh the SnapshotX_Writeable_baseline snapshot? Why or why not?<br>_____<br>_____<br>• View the snapshot for the **ShareX** share using Shadow Copy Client.<br>• Right-click the share name and select **Properties**, then select the **Previous Versions** tab. Is there a snapshot available? _____ |


EMC² where information lives®

| Step | Action |
|---|---|
| | • View the snapshot for the SnapshotX_Writeable share using Shadow Copy Client.<br>• Right-click the share name and select **Properties**, then select the **Previous Versions** tab.<br><br>Is there a snapshot available?<br>_____<br><br>• In the SnapshotX_Writeable share, open two of the files and insert some text. Save the files, then close them. |
| 4 | **Restore the PFS from the writeable snapshot:**<br><br>• This must be done in Unisphere. Name the new snapshot SnapshotX_Write_Restore.<br><br>  <br><br>You have just used the restore feature to commit the changes made in the writeable snapshot to the PFS. You should see the changes made to the two files in the ShareX directory. |
| 5 | **Lab cleanup:**<br><br>• Unmount the two shares from your Windows host.<br>• Delete the /studentX directory.<br>• Delete the VNX#_DM2 CIFS server.<br>• Delete the IP interface used by VNX#_DM2. |

*End of Lab Exercise 16*

*End of Labs*



EMC² where information lives®

# Appendix A: Hurricane Marine, LTD

| | |
|---|---|
| **Description** | *Hurricane Marine, LTD* is a fictitious enterprise that has been created as a case study for VNX training. *Hurricane Marine, LTD* is a world leader in luxury and racing boats and yachts. Their success has been enhanced by EMC's ability to make their information available to all of their staff at the same time. |
| **EMC and Hurricane Marine, LTD** | Until recently, the data storage needs for *Hurricane Marine, LTD* have been provided through direct-attach storage connected to discrete Windows and UNIX servers. Because of recent growth, the data storage needs have greatly increased and *Hurricane Marine, LTD* has engaged EMC to update their data storage. As a result, EMC has just installed a VNX Unified storage system, and *Hurricane Marine, LTD* is now looking to implement the VNX as their key file and block based storage solution. |
| **Environment** | *Hurricane Marine, LTD* computer network consists of both a Microsoft network and Linux. While their engineering staff does the bulk of their work in a Linux environment, all employees have Microsoft Windows based applications as well. Thus, *Hurricane Marine, LTD* has implemented support for both systems. You will find appendixes that outline the design of both the Microsoft and Linux environments. |
| **People** | *Hurricane Marine, LTD's* president and founder is Perry Tesca. The head of his IS department is Ira Techi. You will be working closely with Mr. Techi in implementing EMC VNX into his network. Mr. Techi has some needs that VNX is required to fulfill, but there are also some potential needs that he may like to explore. |
| **Organization Chart** | On the following page is the organizational chart for *Hurricane Marine, LTD.* |

# Appendix A: Hurricane Marine, LTD – Cont.

## Hurricane Marine, LTD - Organization Chart

Perry Tesca President

Liza Minacci Dir. Marketing

| Employees | Engineering Propulsion | Engineering Structural | Sales East | Sales West | Information Systems | Managers |
|---|---|---|---|---|---|---|
| Perry Tesca | *Earl Pallis* | *Edgar South* | *Sarah Emm* | *Seve Wari* | *Ira Techi* | Perry Tesca |
| Liza Minacci | Eddie Pope | Ellen Sele | Sadie Epari | Scott West | Iggy Tallis | Liza Minacci |
| Edgar South | Etta Place | Eric Simons | Sal Eammi | Seda Weir | Isabella Tei | Earl Pallis |
| Earl Pallis | Egan Putter | Eva Song | Sage Early | Seiko Wong | Ivan Teribl | Edgar South |
| Sarah Emm | Eldon Pratt | Ed Sazi | Sam Echo | Sema Welles | | Sarah Emm |
| Seve Wari | Elliot Proh | Evan Swailz | Santos Elton | Selena Willet | | Seve Wari |
| Ira Techi | Elvin Ping | | Saul Ettol | Selma Witt | | Ira Tech |
| Perry Tesca | | | Sash Extra | Sergio Wall | | |
| Ellen Sele | | | Sean Ewer | Seve Wassi | | |
| Eddie Pope | | | | Seymore Wai | | |
| Sadie Epari | | | | Steve Woo | | |
| Scott West | | | | | | |
| Iggy Tallis | | | | | | |
| Liza Minacci | | | | | | |
| Eric Simons | | | | | | |
| Etta Place | | | | | | |
| Sal Eammi | | | | | | |
| Seda Weir | | | | | | |
| Isabella Tei | | | | | | |
| Edgar South | | | | | | |
| Eva Song | | | | | | |
| Egan Putter | | | | | | |
| Sage Early | | | | | | |
| Seiko Wong | | | | | | |
| Ivan Teribl | | | | | | |
| Earl Pallis | | | | | | |
| Ed Sazi | | | | | | |
| Eldon Pratt | | | | | | |
| Sam Echo | | | | | | |
| Sema Welles | | | | | | |
| Ira Tech | | | | | | |
| Evan Swailz | | | | | | |
| Elliot Proh | | | | | | |
| Santos Elton | | | | | | |
| Selena Willet | | | | | | |
| Sarah Emm | | | | | | |
| Elvin Ping | | | | | | |
| Saul Ettol | | | | | | |
| Selma Witt | | | | | | |
| Seve Wari | | | | | | |
| Sash Extra | | | | | | |
| Sergio Wall | | | | | | |
| Sean Ewer | | | | | | |
| Seve Wassi | | | | | | |
| Seymore Wai | | | | | | |
| Steve Woo | | | | | | |

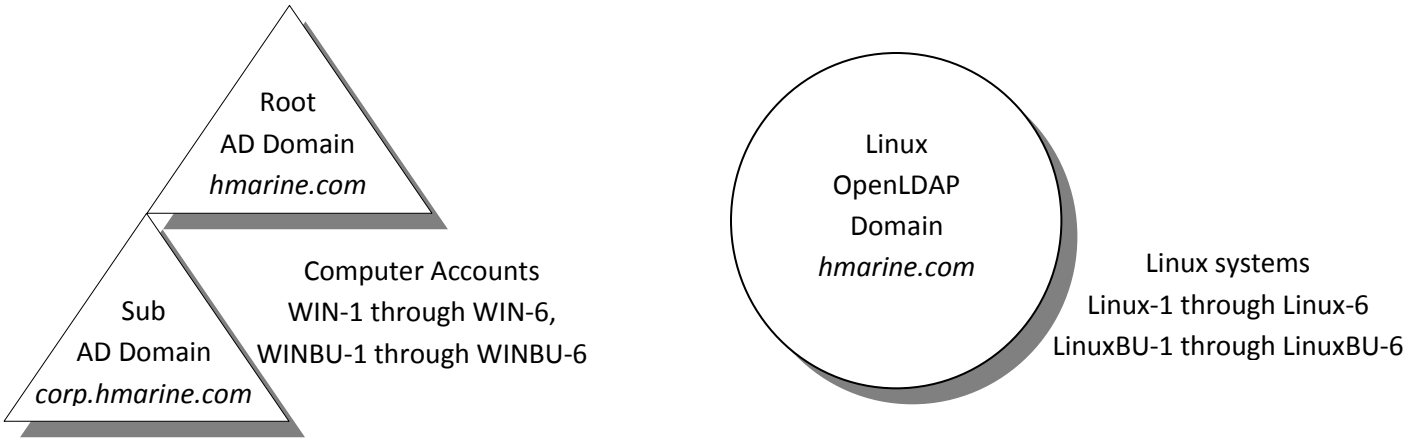


EMC² where information lives®

# Appendix B: Hurricane Marine Domain Environments

| | |
|---|---|
| **Network Services** | DNS Server: 10.127.**X**.161<br>NTP Server: 10.127.**X**.161<br>DHCP: Not in use, all nodes use static IP addresses (See the Appendix F). |

| | |
|---|---|
| **Windows and Linux Domains and systems** | The Windows Active Directory is comprised of the following domains and domain controllers:<br>• *hmarine.com* domain (the root of the forest)<br>  ○ DC: HM-1 IP address: 10.127.**X**.161<br>• *corp.hmarine.com* (a subdomain of the root)<br>  ○ DC: HM-DC2 IP address: 10.127.**X**.162<br><br>Though the root domain is present solely for administrative purposes at this time, *corp.hmarine.com* holds containers for all users, groups, and computer accounts. There are twelve dual-homed Windows systems as domain members that have CIFS and iSCSI access to the VNX systems. The WIN-1 through WIN-6 systems are production CIFS and iSCSI hosts and the WINBU-1 through WINBU-6 systems are backup iSCSI hosts.<br><br>The Linux environment is comprised of the following OpenLDAP domain and server:<br>• *hmarine.com*<br>  ○ HM-3-OpenLDAP IP address: 10.127.**X**.163<br><br>There are twelve dual-homed Linux systems in the OpenLDAP domain that have NFS and iSCSI access to the VNX systems. The Linux-1 through Linux-6 systems are production NFS and iSCSI hosts and the LinuxBU-1 through LinuxBU-6 systems are backup iSCSI hosts. |



# Appendix C: Windows User and Group Memberships

| Hurricane Marine<br>Windows Users & Group Memberships<br>CORP Domain | | |
|---|---|---|
| **Username** | **Full Name** | **NT Global Group** |
| Administrator | | Domain Admins |
| EPallis | Earl Pallis | Propulsion Engineers, Managers |
| EPing | Elvin Ping | Propulsion Engineers |
| EPlace | Etta Place | Propulsion Engineers |
| EPope | Eddie Pope | Propulsion Engineers |
| EPratt | Eldon Pratt | Propulsion Engineers |
| EProh | Elliot Proh | Propulsion Engineers |
| EPutter | Egan Putter | Propulsion Engineers |
| ESazi | Ed Sazi | Structural Engineers |
| ESele | Ellen Sele | Structural Engineers |
| ESimons | Eric Simons | Structural Engineers |
| ESong | Eva Song | Structural Engineers |
| ESouth | Edgar South | Structural Engineers, Managers |
| ESwailz | Evan Swailz | Structural Engineers |
| ITallis | Iggy Tallis | IS, DOMAIN ADMINS |
| ITechi | Ira Techi | IS, DOMAIN ADMINS, Managers |
| ITei | Isabella Tei | IS, DOMAIN ADMINS |
| ITeribl | Ivan Teribl | IS, DOMAIN ADMINS |
| LMinacci | Liza Minacci | Director of Marketing, Managers |
| PTesca | Perry Tesca | President, Managers |
| SEammi | Sal Eammi | Eastcoast Sales |
| SEarly | Sage Early | Eastcoast Sales |
| SEcho | Sam Echo | Eastcoast Sales |
| SElton | Santos Elton | Eastcoast Sales |
| SEmm | Sarah Emm | Eastcoast Sales, Managers |
| SEpari | Sadie Epari | Eastcoast Sales |
| SEttol | Saul Ettol | Eastcoast Sales |
| SEwer | Sean Ewer | Eastcoast Sales |
| SExtra | Sash Extra | Eastcoast Sales |
| SWai | Seymore Wai | Westcoast Sales |
| SWall | Sergio Wall | Westcoast Sales |
| SWari | Seve Wari | Westcoast Sales, Managers |
| SWassi | Seve Wassi | Westcoast Sales |
| SWeir | Seda Weir | Westcoast Sales |
| SWelles | Sema Welles | Westcoast Sales |
| SWest | Scott West | Westcoast Sales |
| SWillet | Selena Willet | Westcoast Sales |
| SWitt | Selma Witt | Westcoast Sales |
| SWong | Seiko Wong | Westcoast Sales |
| SWoo | Steve Woo | Westcoast Sales |



EMC² where information lives®

# Appendix D: Linux Users and Groups

**Hurricane Marine**
**UNIX Users & Group Memberships**
**OpenLDAP Domain hmarine.com**

| Username | Full Name | Group |
|---|---|---|
| epallis | Earl Pallis | engprop, mngr |
| eping | Elvin Ping | engprop |
| eplace | Etta Place | engprop |
| epope | Eddie Pope | engprop |
| epratt | Eldon Pratt | engprop |
| eproh | Elliot Proh | engprop |
| eputter | Egan Putter | engprop |
| esazi | Ed Sazi | engstruc |
| esele | Ellen Sele | engstruc |
| esimons | Eric Simons | engstruc |
| esong | Eva Song | engstruc |
| esouth | Edgar South | engstruc, mngr |
| eswailz | Evan Swailz | engstruc |
| itallis | Iggy Tallis | infotech |
| itechi | Ira Techi | infotech, mngr |
| itei | Isabella Tei | infotech |
| iteribi | Ivan Teribi | infotech |
| lminacci | Liza Minacci | mngr |
| ptesca | Perry Tesca | mngr |
| seammi | Sal Eammi | saleseas |
| searly | Sage Early | saleseas |
| secho | Sam Echo | saleseas |
| selton | Santos Elton | saleseas |
| semm | Sarah Emm | saleseas, mngr |
| separi | Sadie Epari | saleseas |
| settol | Saul Ettol | saleseas |
| sewer | Sean Ewer | saleseas |
| sextra | Sash Extra | saleseas |
| swai | Seymore Wai | saleswes |
| swall | Sergio Wall | saleswes |
| swari | Seve Wari | saleswes, mngr |
| epallis | Seve Wassi | saleswes |
| sweir | Seda Weir | saleswes |
| swelles | Sema Welles | saleswes |
| swest | Scott West | saleswes |
| swillet | Selena Willet | saleswes |
| switt | Selma Witt | saleswes |
| swong | Seiko Wong | saleswes |
| swoo | Steve Woo | saleswes |



EMC² where information lives®

## Appendix E: Ethernet Switch Connectivity to VNX

| Port | Device | VLAN | Port | Device | VLAN |
|---|---|---|---|---|---|
| **Gi1/0/1** | VNX1 DM2 cge-1-0 | 41 | **Gi1/0/2** | VNX1 DM2 cge-1-1 | 41 |
| **Gi1/0/3** | VNX1 DM3 cge-1-0 | 41 | **Gi1/0/4** | VNX1 DM3 cge-1-1 | 41 |
| **Gi1/0/5** | VNX1 DM2 cge-1-2 | 41 | **Gi1/0/6** | VNX1 DM3 cge-1-2 | 41 |
| **Gi1/0/7** | VNX2 DM2 cge-1-0 | 41 | **Gi1/0/8** | VNX2 DM2 cge-1-1 | 41 |
| **Gi1/0/9** | VNX2 DM3 cge-1-0 | 41 | **Gi1/0/10** | VNX2 DM3 cge-1-1 | 41 |
| **Gi1/0/11** | VNX2 DM2 cge-1-2 | 41 | **Gi1/0/12** | VNX2 DM3 cge-1-2 | 41 |
| **Gi1/0/13** | VNX3 DM2 cge-1-0 | 42 | **Gi1/0/14** | VNX3 DM2 cge-1-1 | 42 |
| **Gi1/0/15** | VNX3 DM3 cge-1-0 | 42 | **Gi1/0/16** | VNX3 DM3 cge-1-1 | 42 |
| **Gi1/0/17** | VNX3 DM2 cge-1-2 | 42 | **Gi1/0/18** | VNX3 DM3 cge-1-2 | 42 |
| **Gi1/0/19** | VNX4 DM2 cge-1-0 | 42 | **Gi1/0/20** | VNX4 DM2 cge-1-1 | 42 |
| **Gi1/0/21** | VNX4 DM3 cge-1-0 | 42 | **Gi1/0/22** | VNX4 DM3 cge-1-1 | 42 |
| **Gi1/0/23** | VNX4 DM2 cge-1-2 | 42 | **Gi1/0/24** | VNX4 DM3 cge-1-2 | 42 |
| **Gi1/0/25** | VNX5 DM2 cge-1-0 | 42 | **Gi1/0/26** | VNX5 DM2 cge-1-1 | 42 |
| **Gi1/0/27** | VNX5 DM3 cge-1-0 | 42 | **Gi1/0/28** | VNX5 DM3 cge-1-1 | 42 |
| **Gi1/0/29** | VNX5 DM2 cge-1-2 | 42 | **Gi1/0/30** | VNX5 DM3 cge-1-2 | 42 |
| **Gi1/0/31** | VNX6 DM2 cge-1-0 | 41 | **Gi1/0/32** | VNX6 DM2 cge-1-1 | 41 |
| **Gi1/0/33** | VNX6 DM3 cge-1-0 | 41 | **Gi1/0/34** | VNX6 DM3 cge-1-1 | 41 |
| **Gi1/0/35** | VNX6 DM2 cge-1-2 | 41 | **Gi1/0/36** | VNX6 DM3 cge-1-2 | 41 |
| **Gi1/0/37** | VNX1 CS0 | 41 | **Gi1/0/38** | VNX2 CS0 | 41 |
| **Gi1/0/39** | VNX3 CS0 | 42 | **Gi1/0/40** | VNX4 CS0 | 42 |
| **Gi1/0/41** | VNX5 CS0 | 42 | **Gi1/0/42** | VNX6 CS0 | 41 |
| **Gi2/0/11** | VNX1 SPA A2-1 | 10 | **Gi2/0/12** | VNX1 SPB B2-1 | 10 |
| **Gi2/0/13** | VNX2 SPA A2-1 | 10 | **Gi2/0/14** | VNX2 SPB B2-1 | 10 |
| **Gi2/0/15** | VNX3 SPA A2-1 | 10 | **Gi2/0/16** | VNX3 SPB B2-1 | 10 |
| **Gi2/0/17** | VNX4 SPA A2-1 | 10 | **Gi2/0/18** | VNX4 SPB B2-1 | 10 |
| **Gi2/0/19** | VNX5 SPA A2-1 | 10 | **Gi2/0/20** | VNX5 SPB B2-1 | 10 |
| **Gi2/0/21** | VNX6 SPA A2-1 | 10 | **Gi2/0/22** | VNX6 SPB B2-1 | 10 |
| **Gi2/0/23** | VNX1 SPA A2-2 | 10 | **Gi2/0/24** | VNX1 SPB B2-2 | 10 |
| **Gi2/0/25** | VNX2 SPA A2-2 | 10 | **Gi2/0/26** | VNX2 SPB B2-2 | 10 |
| **Gi2/0/27** | VNX3 SPA A2-2 | 10 | **Gi2/0/28** | VNX3 SPB B2-2 | 10 |
| **Gi2/0/29** | VNX4 SPA A2-2 | 10 | **Gi2/0/30** | VNX4 SPB B2-2 | 10 |



EMC² where information lives®

# Appendix F: Team – IP Addresses Summary

| | |
|---|---|
| **Purpose** | This appendix provides a summary of team systems, IP addressing, network service addresses, and credentials. |

| | |
|---|---|
| **Description** | Each team has all the necessary information regarding the IPs addresses, domains, workstations, and user credentials to complete the labs. |

| | |
|---|---|
| **Reference** | Appendix F. |



EMC² where information lives®

| Team1 | | | | | |
|---|---|---|---|---|---|
| **Name** | **Device** | **IP Address** | **Netmask** | **Broadcast** | **Gateway** |
| **VNX1cs0** | eth3 | 10.127.**X**.110 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **VNX1 SPA** | Mgmt | 10.127.**X**.111 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **VNX1 SPB** | Mgmt | 10.127.**X**.115 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **VNX1 SPA iSCSI** | A2-1 | 192.168.1.10 | 255.255.255.0 | NA | NA |
| **VNX1 SPA iSCSI** | A2-2 | 192.168.1.11 | 255.255.255.0 | NA | NA |
| **VNX1 SPB iSCSI** | B2-1 | 192.168.1.12 | 255.255.255.0 | NA | NA |
| **VNX1 SPB iSCSI** | B2-2 | 192.168.1.13 | 255.255.255.0 | NA | NA |
| **VNX1_DM2** | cge-1-0 | 10.127.**X**.112 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **VNX1_DM2** | cge-1-1 | 10.127.**X**.113 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **VNX1_DM2 VLAN tag** | lacp0 | 10.127.**X**.201 | 255.255.255.224 | 10.127.**X**.223 | 10.127.**X**.222 |
| **VNX1_DM3** | cge-1-0 | 10.127.**X**.114 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **SAN-1 (Physical Host)** | net1 | 10.127.**X**.11 | 255.255.255.224 | 10.127.**X**.31 | 10.127.**X**.30 |
| **SAN-1** | net2 | 192.168.0.1 | 255.255.255.0 | NA | NA |
| **WIN-1 (VM Host)** | net1 | 10.127.**X**.171 | 255.255.255.224 | 10.127.**X**.191 | 10.127.**X**.190 |
| **WIN-1** | net2 | 192.168.1.15 | 255.255.255.0 | NA | NA |
| **Linux-1 (VM Host)** | eth0 | 10.127.**X**.1 | 255.255.255.224 | 10.127.**X**.31 | 10.127.**X**.30 |
| **Linux-1** | eth1 | 192.168.1.14 | 255.255.255.0 | NA | NA |
| **DNS** | HM-1 | 10.127.**X**.161 | | | |
| **NTP** | HM-1 | 10.127.**X.**161 | | | |

**X** designates the lab setup number. Replace the **X** with the assigned setup number.

VNX Unisphere credentials: *sysadmin/sysadmin*

VNX Control Station CLI credentials: *nasadmin/ad**X**min* and *root/nasadmin*

DNS domain name: corp.hmarine.com

The *corp.hmarine.com* AD domain **Administrator** password: **adXmin**

All *WIN-X* and *WINBU-X* systems have a local **Administrator** user with the password: **adXmin**

All *Linux-X* and *LinuxBU-X* systems have a local **root** user with the password: **adXmin**

All Windows users in *Hurricane Marine, LTD* have accounts on the *corp.hmarine.com* AD domain. For lab simplicity, all of its users have a password of "**password**".

All UNIX users in *Hurricane Marine, LTD* have accounts on the *hmarine.com* OpenLDAP domain. For lab simplicity, all of its users have a password of "**password**".



EMC² where information lives®

| Team2 | | | | | |
|---|---|---|---|---|---|
| **Name** | **Device** | **IP Address** | **Netmask** | **Broadcast** | **Gateway** |
| **VNX2cs0** | eth3 | 10.127.**X**.120 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **VNX2 SPA** | Mgmt | 10.127.**X**.121 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **VNX2 SPB** | Mgmt | 10.127.**X**.125 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **VNX2 SPA iSCSI** | A2-1 | 192.168.1.20 | 255.255.255.0 | NA | NA |
| **VNX2 SPA iSCSI** | A2-2 | 192.168.1.21 | 255.255.255.0 | NA | NA |
| **VNX2 SPB iSCSI** | B2-1 | 192.168.1.22 | 255.255.255.0 | NA | NA |
| **VNX2 SBB iSCSI** | B2-1 | 192.168.1.23 | 255.255.255.0 | NA | NA |
| **VNX2_DM2** | cge-1-0 | 10.127.**X**.122 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **VNX2_DM2** | cge-1-1 | 10.127.**X**.123 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **VNX2_DM2 VLAN tag** | lacp0 | 10.127.**X**.202 | 255.255.255.224 | 10.127.**X**.223 | 10.127.**X**.222 |
| **VNX2_DM3** | cge-1-0 | 10.127.**X**.124 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **SAN-2 (Physical Host)** | net1 | 10.127.**X**.12 | 255.255.255.224 | 10.127.**X**.31 | 10.127.**X**.30 |
| **SAN-2** | net2 | 192.168.0.1 | 255.255.255.0 | NA | NA |
| **WIN-2 (VM Host)** | net1 | 10.127.**X**.172 | 255.255.255.224 | 10.127.**X**.191 | 10.127.**X**.190 |
| **WIN-1** | net2 | 192.168.1.25 | 255.255.255.0 | NA | NA |
| **Linux-2 (VM Host)** | eth0 | 10.127.**X**.2 | 255.255.255.224 | 10.127.**X**.31 | 10.127.**X**.30 |
| **Linux-2** | eth1 | 192.168.1.24 | 255.255.255.0 | NA | NA |
| **DNS** | HM-1 | 10.127.**X**.161 | | | |
| **NTP** | HM-1 | 10.127.**X.**161 | | | |

**X** designates the lab setup number. Replace the **X** with the assigned setup number.

VNX Unisphere credentials: *sysadmin/sysadmin*

VNX Control Station CLI credentials: *nasadmin/ad**X**min* and *root/nasadmin*

DNS domain name: corp.hmarine.com

The *corp.hmarine.com* AD domain **Administrator** password: **adXmin**

All *WIN-X* and *WINBU-X* systems have a local **Administrator** user with the password: **adXmin**

All *Linux-X* and *LinuxBU-X* systems have a local **root** user with the password: **adXmin**

All Windows users in *Hurricane Marine, LTD* have accounts on the *corp.hmarine.com* AD domain. For lab simplicity, all of its users have a password of "**password**".

All UNIX users in *Hurricane Marine, LTD* have accounts on the *hmarine.com* OpenLDAP domain. For lab simplicity, all of its users have a password of "**password**".

| Team3 | | | | | |
|---|---|---|---|---|---|
| **Name** | **Device** | **IP Address** | **Netmask** | **Broadcast** | **Gateway** |
| **VNX3cs0** | eth3 | 10.127.**X**.130 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **VNX SPA** | Mgmt | 10.127.**X**.131 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **VNX SPB** | Mgmt | 10.127.**X**.135 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **VNX3 SPA iSCSI** | A2-1 | 192.168.1.30 | 255.255.255.0 | NA | NA |
| **VNX3 SPA iSCSI** | A2-2 | 192.168.1.31 | 255.255.255.0 | NA | NA |
| **VNX3 SPB iSCSI** | B2-1 | 192.168.1.32 | 255.255.255.0 | NA | NA |
| **VNX3 SPB iSCSI** | B2-2 | 192.168.1.33 | 255.255.255.0 | NA | NA |
| **VNX3_DM2** | cge-1-0 | 10.127.**X**.132 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **VNX3_DM2** | cge-1-1 | 10.127.**X**.133 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **VNX3_DM2 VLAN tag** | lacp0 | 10.127.**X**.203 | 255.255.255.224 | 10.127.**X**.223 | 10.127.**X**.222 |
| **VNX3_DM3** | cge-1-0 | 10.127.**X**.134 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **SAN-3 (Physical Host)** | net1 | 10.127.**X**.13 | 255.255.255.224 | 10.127.**X**.31 | 10.127.**X**.30 |
| **SAN-3** | net2 | 192.168.0.1 | 255.255.255.0 | NA | NA |
| **WIN-3 (VM Host)** | net1 | 10.127.**X**.173 | 255.255.255.224 | 10.127.**X**.191 | 10.127.**X**.190 |
| **WIN-3** | net2 | 192.168.1.35 | 255.255.255.0 | NA | NA |
| **Linux-3 (VM Host)** | eth0 | 10.127.**X**.3 | 255.255.255.224 | 10.127.**X**.31 | 10.127.**X**.30 |
| **Linux-3** | eth1 | 192.168.1.34 | 255.255.255.0 | NA | NA |
| **DNS** | HM-1 | 10.127.**X**.161 | | | |
| **NTP** | HM-1 | 10.127.**X.**161 | | | |

**X** designates the lab setup number. Replace the **X** with the assigned setup number.

VNX Unisphere credentials: *sysadmin/sysadmin*

VNX Control Station CLI credentials: *nasadmin/ad**X**min* and *root/nasadmin*

DNS domain name: corp.hmarine.com

The *corp.hmarine.com* AD domain **Administrator** password: **adXmin**

All *WIN-X* and *WINBU-X* systems have a local **Administrator** user with the password: **adXmin**

All *Linux-X* and *LinuxBU-X* systems have a local **root** user with the password: **adXmin**

All Windows users in *Hurricane Marine, LTD* have accounts on the *corp.hmarine.com* AD domain. For lab simplicity, all of its users have a password of "**password**".

All UNIX users in *Hurricane Marine, LTD* have accounts on the *hmarine.com* OpenLDAP domain. For lab simplicity, all of its users have a password of "**password**".



EMC² where information lives®

| Team4 | | | | | |
|---|---|---|---|---|---|
| **Name** | **Device** | **IP Address** | **Netmask** | **Broadcast** | **Gateway** |
| **VNX4cs0** | eth3 | 10.127.**X**.140 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **VNX4 SPA** | Mgmt | 10.127.**X**.141 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **VNX4 SPB** | Mgmt | 10.127.**X**.145 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **VNX4 SPA iSCSI** | A2-1 | 192.168.1.40 | 255.255.255.0 | NA | NA |
| **VNX4 SPA iSCSI** | A2-2 | 192.168.1.41 | 255.255.255.0 | NA | NA |
| **VNX4 SPB iSCSI** | B2-1 | 192.168.1.42 | 255.255.255.0 | NA | NA |
| **VNX4 SPB iSCSI** | B2-2 | 192.168.1.43 | 255.255.255.0 | NA | NA |
| **VNX4_DM2** | cge-1-0 | 10.127.**X**.142 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **VNX4_DM2** | cge-1-1 | 10.127.**X**.143 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **VNX4_DM2 VLAN tag** | lacp0 | 10.127.**X**.204 | 255.255.255.224 | 10.127.**X**.223 | 10.127.**X**.222 |
| **VNX4_DM3** | cge-1-0 | 10.127.**X**.144 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **SAN-4 (Physical Host)** | net1 | 10.127.**X**.14 | 255.255.255.224 | 10.127.**X**.31 | 10.127.**X**.30 |
| **SAN-4** | net2 | 192.168.0.1 | 255.255.255.0 | NA | NA |
| **WIN-4 (VM Host)** | net1 | 10.127.**X**.174 | 255.255.255.224 | 10.127.**X**.191 | 10.127.**X**.190 |
| **WIN-4** | net2 | 192.168.1.45 | 255.255.255.0 | NA | NA |
| **Linux-4 (VM Host)** | eth0 | 10.127.**X**.4 | 255.255.255.224 | 10.127.**X**.31 | 10.127.**X**.30 |
| **Linux-4** | eth1 | 192.168.1.44 | 255.255.255.0 | NA | NA |
| **DNS** | HM-1 | 10.127.**X**.161 | | | |
| **NTP** | HM-1 | 10.127.**X.**161 | | | |

**X** designates the lab setup number. Replace the **X** with the assigned setup number.

VNX Unisphere credentials: *sysadmin/sysadmin*

VNX Control Station CLI credentials: *nasadmin/ad**X**min* and *root/nasadmin*

DNS domain name: corp.hmarine.com

The *corp.hmarine.com* AD domain **Administrator** password: **adXmin**

All *WIN-X* and *WINBU-X* systems have a local **Administrator** user with the password: **adXmin**

All *Linux-X* and *LinuxBU-X* systems have a local **root** user with the password: **adXmin**

All Windows users in *Hurricane Marine, LTD* have accounts on the *corp.hmarine.com* AD domain. For lab simplicity, all of its users have a password of "**password**".

All UNIX users in *Hurricane Marine, LTD* have accounts on the *hmarine.com* OpenLDAP domain. For lab simplicity, all of its users have a password of "**password**".

| Team5 | | | | | |
|---|---|---|---|---|---|
| **Name** | **Device** | **IP Address** | **Netmask** | **Broadcast** | **Gateway** |
| **VNX5cs0** | eth3 | 10.127.**X**.150 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **VNX5 SPA** | Mgmt | 10.127.**X**.151 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **VNX5 SPB** | Mgmt | 10.127.**X**.155 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **VNX5 SPA iSCSI** | A2-1 | 192.168.1.50 | 255.255.255.0 | NA | NA |
| **VNX5 SPA iSCSI** | A2-2 | 192.168.1.51 | 255.255.255.0 | NA | NA |
| **VNX5 SPB iSCSI** | B2-1 | 192.168.1.52 | 255.255.255.0 | NA | NA |
| **VNX5 SPB iSCSI** | B2-2 | 192.168.1.53 | 255.255.255.0 | NA | NA |
| **VNX5_DM2** | cge-1-0 | 10.127.**X**.152 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **VNX5_DM2** | cge-1-1 | 10.127.**X**.153 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **VNX5_DM2 VLAN tag** | lacp0 | 10.127.**X**.205 | 255.255.255.224 | 10.127.**X**.223 | 10.127.**X**.222 |
| **VNX5_DM3** | cge-1-0 | 10.127.**X**.154 | 255.255.255.224 | 10.127.**X**.159 | 10.127.**X**.158 |
| **SAN-5 (Physical Host)** | net1 | 10.127.**X**.15 | 255.255.255.224 | 10.127.**X**.31 | 10.127.**X**.30 |
| **SAN-5** | net2 | 192.168.0.1 | 255.255.255.0 | NA | NA |
| **WIN-5 (VM Host)** | net1 | 10.127.**X**.175 | 255.255.255.224 | 10.127.**X**.191 | 10.127.**X**.190 |
| **WIN-5** | net2 | 192.168.1.55 | 255.255.255.0 | NA | NA |
| **Linux-5 (VM Host)** | eth0 | 10.127.**X**.5 | 255.255.255.224 | 10.127.**X**.31 | 10.127.**X**.30 |
| **Linux-5** | eth1 | 192.168.1.54 | 255.255.255.0 | NA | NA |
| **DNS** | HM-1 | 10.127.**X**.161 | | | |
| **NTP** | HM-1 | 10.127.**X.**161 | | | |

**X** designates the lab setup number. Replace the **X** with the assigned setup number.

VNX Unisphere credentials: *sysadmin/sysadmin*

VNX Control Station CLI credentials: *nasadmin/ad**X**min* and *root/nasadmin*

DNS domain name: corp.hmarine.com

The *corp.hmarine.com* AD domain **Administrator** password: **adXmin**

All *WIN-X* and *WINBU-X* systems have a local **Administrator** user with the password: **adXmin**

All *Linux-X* and *LinuxBU-X* systems have a local **root** user with the password: **adXmin**

All Windows users in *Hurricane Marine, LTD* have accounts on the *corp.hmarine.com* AD domain. For lab simplicity, all of its users have a password of "**password**".

All UNIX users in *Hurricane Marine, LTD* have accounts on the *hmarine.com* OpenLDAP domain. For lab simplicity, all of its users have a password of "**password**".



EMC² where information lives®

| Team6 | | | | | |
|---|---|---|---|---|---|
| **Name** | **Device** | **IP Address** | **Netmask** | **Broadcast** | **Gateway** |
| **VNX6cs0** | eth3 | 10.127.**X**.100 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **VNX SPA** | Mgmt | 10.127.**X**.101 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **VNX SPB** | Mgmt | 10.127.**X**.105 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **VNX6 SPA iSCSI** | A2-1 | 192.168.1.60 | 255.255.255.0 | NA | NA |
| **VNX6 SPA iSCSI** | A2-2 | 192.168.1.61 | 255.255.255.0 | NA | NA |
| **VNX6 SPB iSCSI** | B2-1 | 192.168.1.62 | 255.255.255.0 | NA | NA |
| **VNX6 SPB iSCSI** | B2-2 | 192.168.1.63 | 255.255.255.0 | NA | NA |
| **VNX6_DM2** | cge-1-0 | 10.127.**X**.102 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **VNX6_DM2** | cge-1-1 | 10.127.**X**.103 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **VNX6_DM2 VLAN tag** | lacp0 | 10.127.**X**.206 | 255.255.255.224 | 10.127.**X**.223 | 10.127.**X**.222 |
| **VNX6_DM3** | cge-1-0 | 10.127.**X**.164 | 255.255.255.224 | 10.127.**X**.127 | 10.127.**X**.126 |
| **SAN-6 (Physical Host)** | net1 | 10.127.**X**.16 | 255.255.255.224 | 10.127.**X**.31 | 10.127.**X**.30 |
| **SAN-6** | net2 | 192.168.0.1 | 255.255.255.0 | NA | NA |
| **WIN-6 (VM Host)** | net1 | 10.127.**X**.176 | 255.255.255.224 | 10.127.**X**.191 | 10.127.**X**.190 |
| **WIN-6** | net2 | 192.168.1.65 | 255.255.255.0 | NA | NA |
| **Linux-6 (VM Host)** | eth0 | 10.127.**X**.6 | 255.255.255.224 | 10.127.**X**.31 | 10.127.**X**.30 |
| **Linux-6** | eth1 | 192.168.1.64 | 255.255.255.0 | NA | NA |
| **DNS** | HM-1 | 10.127.**X**.161 | | | |
| **NTP** | HM-1 | 10.127.**X.**161 | | | |

**X** designates the lab setup number. Replace the **X** with the assigned setup number.

VNX Unisphere credentials: *sysadmin/sysadmin*

VNX Control Station CLI credentials: *nasadmin/ad**X**min* and *root/nasadmin*

DNS domain name: corp.hmarine.com

The *corp.hmarine.com* AD domain **Administrator** password: **adXmin**

All *WIN-X* and *WINBU-X* systems have a local **Administrator** user with the password: **adXmin**

All *Linux-X* and *LinuxBU-X* systems have a local **root** user with the password: **adXmin**

All Windows users in *Hurricane Marine, LTD* have accounts on the *corp.hmarine.com* AD domain. For lab simplicity, all of its users have a password of "**password**".

All UNIX users in *Hurricane Marine, LTD* have accounts on the *hmarine.com* OpenLDAP domain. For lab simplicity, all of its users have a password of "**password**".



EMC² where information lives®

# End of Lab



EMC²
where information lives®